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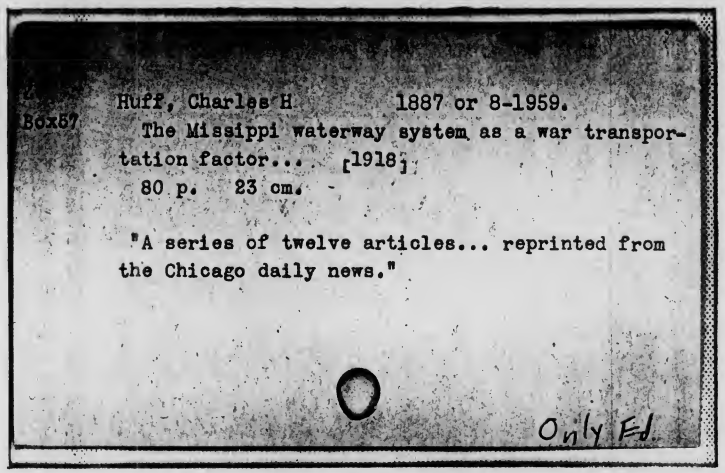
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THE

MISSISSIPPI WATERWAY SYSTEM

AS A

War Transportation Factor

A Series of
Twelve Articles
by
CHARLES H. HUFF
reprinted from
THE CHICAGO DAILY NEWS

THE inability of the nation's railroad facilities to meet the combined demands of war transportation and domestic commerce has drawn national attention to the inland waterways as potential transportation factors. In order to present clearly the possible value of the Mississippi Waterway System for transportation purposes, Charles H. Huff visited more than forty cities on the Mississippi River and its principal tributaries. Upon his study and observation, he wrote the twelve articles reprinted herein. These articles reveal the status of existing river traffic, present terminal facilities, plans for river terminal development, and the possibilities for a large freight movement, and the possibilities both to serve domestic commerce and to expedite the movement of war materials for export to Europe. They were published serially during June and July of 1918, at a time when the government was laying plans for the establishment of barge lines on the Lower Mississippi.

THE TWIN CITIES AS HEAD OF NAVIGATION

The Twin Cities—Minneapolis and St. Paul—commonly are referred to as the head of navigation on the Mississippi River. It would be more nearly correct to refer to them as the head of potential navigation. There is to be found virtually no evidence of river traffic. There is, however, abundant evidence of enormous possibilities for river traffic. There is, also, definite evidence of activity on the part of the two cities to make ready for waterway transportation.

Boats, adapted to the conditions which must be met along the Upper Mississippi, could perform wonderfully in relieving the strain on railroad facilities due to the immense tonnage into and out of the Twin Cities. The inbound tonnage is of large proportions because of the vast area of agricultural country for which Minneapolis and St. Paul are the points of distribution. The outbound tonnage is an enormous item, due chiefly to the huge stores of grain and grain products which the two cities send out, from the great producing northwest, to the consuming eastern half of the United States and to the markets across the Atlantic.

When it is considered that the record of Minneapolis for thirty-seven years shows an annual foreign export of flour always above 1,000,000 barrels, and in some years in excess of 4,000,000 barrels, and it is conceived what that one item alone is doing, in this time of war, to increase the congestion at Atlantic ports, it is possible to begin to appreciate what boats operating between Minneapolis and New Orleans would mean toward relieving the over-taxed avenues of intercourse because the United States and the battlefields of Europe. In handling its share of the 1916 wheat crop of the northwest, for instance, Minneapolis shipped 37,000,000 bushels of wheat, 17,000,000 barrels of flour, and 717,000 tons of millstuff. All of that was shipped by rail. It was wedged, in large measure, through Chicago, over the heavily-taxed

eastbound trunk lines, and into the congested Atlantic seaports for transshipment. **The point is that river traffic holds the possibility of diverting at least a large part of that immense bulk freight to waterway shipment from the source—a war measure of inestimable value.** This, incidentally, is only one item.

The Twin Cities will be considered, in this instance, in two phases: First, as to local conditions, river front development, and prospective development; second, as to the possibilities for river traffic indicated by the manufacturing output and the commercial interchange.

Distinguishing between the two cities, Minneapolis is properly the head of potential navigation on the Mississippi River. By river, the distance between the harbors of the two cities is ten miles. Until a year ago, navigation above St. Paul was not practicable. Last summer marked the completion of a government dam and lock just above Fort Snelling, on a bend in the river between the two cities, which resulted in extending the navigable channel to the proposed harbor site at Minneapolis.

In undertaking dock development, Minneapolis had difficulties to meet. St. Paul had no similar difficulties. Minneapolis met the situation, however, by digging out solid rock formation and building a modern sea wall. The wall is 1,234 feet in length—the length of three ordinary city blocks. The wall is sufficiently high for high water conditions. The channel at the dock is six feet, but the wall is sunk into solid rock at a sufficient depth to permit dredging for the development of a nine-foot channel. The city has acquired sufficient land behind the harbor wall for modern river-rail terminal development.

That is the extent of completed work in the Minneapolis harbor, representing an investment of $100,000. Plans for a terminal unit, however, have been prepared by City Engineer F. W. Cappelen. The necessary bond issue has been authorized and the work is to be done promptly.

In this connection, it is interesting to learn of official government

sanction of municipal expenditures for river terminal development. Because of the government's request that cities postpone improvement projects in the interest of the war, Mr. Cappelen sought advice in Washington with respect to proceeding with the sale of the authorized bonds for the river terminal. On May 10 of this year, C. Keller, brigadier general, Engineers, secretary of the Commission on Inland Waterways, wrote to the Advisory Committee of the Capital Issues Committee of the Federal Reserve Board, at Washington, with respect to the Minneapolis river terminal plan. The following is quoted from the letter:

"The details of the plan have now been furnished by the city engineer and have been shown to the committee, which is of the opinion that the improvement is one that ought to prove a public benefit and it is, therefore, hoped that the proposed issue of bonds will be approved by your body.

"Contracts are at this moment being closed for the construction of floating equipment to be operated on the Upper Mississippi River. **Without a number of terminals, such as the one now proposed to be built at Minneapolis, it will be impossible to put these barges to any profitable use, while should the terminals be built the barge line will, undoubtedly, prove to be a great public benefit, particularly at this time when railroad transportation is lacking both in quantity and quality."**

This letter was in response to a request by the Advisory Committee for advice with respect to the necessity of building the Minneapolis terminal. It has the effect of excluding river terminal development from restricted municipal projects. In fact, it has even the effect of pointing to the urgency of river terminal development by cities.

The plans to be carried out at Minneapolis are to provide a modern warehouse, on the dock, 40 by 200; modern conveying machinery for direct transfer of freight between boat and warehouse, or between boat and railroad car; the building of 6,870 feet of terminal railroad tracks, to connect by incline with the elevated

tracks of the Minneapolis & St. Louis Railroad. The present franchise agreement between that railroad and the city requires that the railroad permit the connection and afford switching facilities with all railroads entering Minneapolis. Minneapolis proposes also to build a modern waterfront grain elevator on the dock.

Because of a peculiar condition, the dock is a distance of twenty blocks below the business center of the city. Directly opposite the business district, the river front is unapproachable because of industrial and railroad development. The dock is at the very head of the navigable channel, due to a condition of dams, rapids and water power plants above. That situation, in one respect, is unfortunate. Above the dock, along the river, is a group of immense milling establishments. It would be decidedly fortunate if the condition of the river would permit the loading of barges directly at those mills, to make unnecessary the railroad or team movement to the dock. To overcome that situation presents difficulities, nevertheless it is one that Minneapolis should undertake to solve, inasmuch as mill products promise to be one of the leading items of river shipment at that point.

As a terminal for rail and river interchange, the Minneapolis dock probably will prove highly effective. A serious problem must be met, however, in making the dock easily accessible for teams and trucks. The block immediately behind the harbor wall is in the form of a precipitate bluff, thus presenting a difficult team track problem, which adds itself to the distance haul.

Minneapolis, devoid of actual boating, has had one experiment in barge transportation. Last summer, the Deere & Weber Company, distributors of agricultural implements, brought five barges loaded with implements up the river from Moline, Ill. Using antique barges and failing to find efficient landing facilities combined to make the experiment expensive. It did demonstrate, however, the feasibility of using the river for such inbound traffic, once

modern barges and modern terminals are provided.

St. Paul, during years past the head of river packet traffic, has contiguous to its principal business district an old-type dock designed to accommodate old-type river packets. It is a dock 50x800—a wooden wall structure—equipped with a frame warehouse and no modern devices. At a site six blocks up the river from that dock, however, St. Paul is engaged in providing facilities to accommodate modern river equipment. It is being built on a scale less comprehensive than the Minneapolis plan, but will serve to enable effective rail and river interchange.

The work, now half completed, consists of building along the water's edge a piling trestle, 800 feet in length. This will enable barge landing at any stage of water. The trestle will carry a crane track. A crane and other modern conveying machinery, plans for which have been completed, are to be installed. This terminal is to serve principally for interchange between boats and railroad cars. It will be equipped to handle, according to estimate, 2,000 tons of coal daily. No warehouse facilities are contemplated at this point. The structure and equipment will represent an investment of $100,000.

Railroad switching facilities are at hand, at this site. The terminal, also, is easily approachable from the business center of the city.

For the shipment of iron ore by river—a promising item as soon as modern barges are available—St. Paul has a more or less makeshift arrangement with which the city proposes to content itself until traffic has actually developed to a point demanding more adequate facilities. That arrangement consists of ore chutes provided by holes cut through the floor of a terminal railroad bridge across the river about three miles below the terminal just described. A tentative arrangement exists with the railroad whereby ore cars may be taken on the bridge, over the chutes, for transferring the ore to barges below. A side track is provided at one end of the bridge, where the cars may be held until use of the

bridge for crossing trains is not needed. By this device, it is possible to unload a car of ore into a barge in fifteen minutes.

This facility was used last year when Edward F. Goltra of St. Louis made the experiment of taking six barges loaded with coal to St. Paul and returning with the barges loaded with iron ore. That experiment, like the instance of the trial trip with agricultural implements to Minneapolis, was made with antiquated equipment and was not a startling success with respect to time in transit, but it did demonstrate the feasibility of using the Mississippi River for bringing coal to the Twin Cities and for taking iron ore to points further south.

The only river freight traffic at St. Paul heretofore has been small package business, handled by old-time river packets, and has been of no real consequence as a river traffic factor. **The prospect for this year is only one packet with an uncertain schedule.**

The grain and milling activity is the important factor in seeking to identify the Twin Cities with possible river traffic. At Minneapolis, last year's receipts of all grain, by railroad, totaled 181,000,000 bushels. Of that total, 101,000,000 bushels was in wheat. The city received 888,000 barrels of flour and shipped almost 18,000,000 barrels, showing the extent of the immense milling industry. Of the wheat receipts indicated, only 33,000,000 bushels was shipped as wheat, the difference being milled. **The total grain shipped amounted to 107,000,000 bushels. That immense tonnage of bulk grain, a large part of which was export, moved entirely by rail.** To show what this meant in the use of freight cars, it may be mentioned that the grain shipments from Minneapolis last year amounted to 74,000 car loads. The receipts of all grain totaled 141,000 car loads.

Minneapolis has twenty-eight mills wtih a daily capacity of 93,000 barrels. The city has fifty-nine grain elevators, with a capacity of 53,000,000 bushels. There are six linseed mills with an annual capacity of more than 15,000,000 bushels of flax, 770,000 barrels of oil, and 300,000 tons of oil cake.

In St. Paul, grain is a less important item. St. Paul has elevator capacity of only 100,000 bushels and gets only about three per cent of the grain received by the two cities. St. Paul, however, has a heavy tonnage in agricultural implements, coal and coke, machinery, building material and trucks.

The total railroad tonnage of Minneapolis amounts to 381,000 cars in receipts and 371,000 cars in shipments. The annual factory output is valued at $188,000,000. Minneapolis is the nation's largest distributor of agricultural implements, supplying largely the vast farm lands of Minnesota, North Dakota, South Dakota and Montana. The city supplies that same immense territory with coal, hardware, mill work and general merchandise.

In railroad tonnage and in manufacturing output, St. Paul equals about one-half the totals of Minneapolis.

River traffic could be an important factor to the Twin Cities for the receipt of coal, iron pipe, agricultural implements, hardware, steel. oil, canned goods, sugar, coffee, rice, paving materials and various lines of manufactured products; for the shipment of grain, flour, iron ore, mill feed, linseed oil, oil cake, cereal foods and furniture.

Minneapolis and St. Paul, with a combined population of 700,000, constitute the distributing metropolis of the Northwest. The two cites are an important railroad center, having nine important trunk lines.

By water route, the two cities are slightly more than 1,900 miles from the Gulf of Mexico. That long stretch of the Mississippi River is navigable, but the statement should be qualified, in view of the various channel depths in different sections of the river. That is to say, the type of boat which could navigate between New Orleans and St. Louis might not find it possible to proceed up the river to Minneapolis. Below St. Louis, the channel is 8 feet to Cairo, and 9 feet below Cairo to New Orleans. Above St. Louis, however. the channel is presumed to be 6 feet,

and is, in low water times, scarcely more than 4 feet.

Water traffic between the Twin Cities and the gulf port to the open sea, therefore, at least until a deeper channel for the Upper Mississippi is provided, must take the actual conditions into account, and boats adapted to those conditions must be provided, if the traffic is to be operated successfully. The possibilities for making such traffic an immense factor in relieving railroad inadequacy are shown to be enormous.

MISSISSIPPI POINTS DOWN TO DAVENPORT

Along the first 360 miles of the Upper Mississippi River, coming down from the Twin Cities, are eight cities which ought to figure as factors in developing traffic on the Mississippi Waterway System as a means of relieving railroad congestion and aiding in war transportation. The only river traffic at any of those points at present is occasional packet service, handling package freight in a small way. As a factor in handling the real tonnage of those points, the existing river traffic may be totally ignored.

At each of the eight cities, there is considerable thought along the line of establishing actual boat service. At each city, the industrial and commercial situation presents definite possibilities for contributing to the effectiveness of such service. At only one of the eight points, however—at Davenport—is there any evidence of actual modern terminal construction. Some of the other points have plans, more or less indefinite. There is an unfortunate general tendency to wait for the boats, even before committing themselves to terminal plans. Coupled with that tendency, surprisingly, is a hope that the boats will come. There is unanimous interest in river traffic possibilities.

The situation would be otherwise if the cities along this stretch of the Mississippi had given attention to the commercial value of their river location in even a measure of the degree with which they have made capital of the recreational value of water frontage. It has **been the rule to find attractive riverfront parks within a stone's throw of the principal business districts. But public money for commercial terminals has not been forthcoming in the same measure.**

The cities along this section of the Mississippi, in order down the river, are Red Wing, Minn.; Winona, Minn.; LaCrosse, Wis.; Dubuque, Ia.; Clinton, Ia.; Moline, Ill.; Rock Island, Ill., and Davenport, Ia. The three last named form a group and commonly are referred to as the Tri-

Cities. They form a single railroad and industrial community.

These cities are factors to consider in connection with possible river traffic not only because of their local consumption or their local manufacturing output, but because each, due to railroad facilities, is a point of distribution for a tributary area.

Red Wing, the smallest of the eight cities named, is about fifty miles below Minneapolis, by river. It is a distributing point for an important agricultural area, as well as having a considerable manufacturing industry, chiefly in motors and shoes. The city has an attractive river front park but a totally unimproved boat landing. The water front offers excellent opportunity for terminal development for rail and river interchange. A traffic bridge to the east crosses the Mississippi at Red Wing.

Winona, a city of 23,000, on the west bank of the Mississippi 130 miles below Minneapolis, is without river terminal plans. A committee of the local Association of Commerce is persistently endeavoring to stir the municipal officials to river terminal action. The topography at Winona is ideal for the development of a modern river terminal. There is scarcely any grade in the streets leading from the business district to the river, which is not often the case in river cities.

The business district is only two blocks back from the river. The harbor at Winona is exceptionally deep. The only river front development, however, consists of an attractive water front park, built up to a wall near the water's edge. Outside of the wall there is a narrow rock levee. In addition to this, there is a small frame warehouse to accommodate packet business on a small scale.

A group of industrial plants, including a flour mill of considerable proportions, is built along the river front below the park. River traffic with modern barges, would make it profitable for those plants to develop private water terminals. Winona has five railroads and is the point of distribution for a large section of Southern Minnesota. The city manufactures principally flour, wagons, tractors, flax fiber products and farm implements. River traffic could be a real factor at Winona.

Curiously enough, on the day of my visit at Winona, a local newspaper reprinted from the Boston Post an editorial which emphasized in broad terms the opening of the New York State Barge Canal as providing "a great water route." **The editorial drew attention to the effective relief use of the New York canal would afford the over-taxed railroads. There was no reference, however, to the opportunity at Winona's front door.**

La Crosse, with 36,000 population, 160 miles below the Twin Cities, is the first point of importance on the east bank of the Mississippi, going down the river from St. Paul. The city also is the only important Wisconsin point on the Mississippi waterway. Although without modern river terminal facilities and without definite plans for such facilities, La Crosse has extensive park development along the river front. The park is behind a substantial wall, between which and the water line is a paved levee of the sloping variety. At the south end of the park, the city has built a fireproof warehouse to accommodate packet freight.

Such thought as is being directed toward modern terminal development contemplates the acquisition of land below the present warehouse, where railroad facilities are extensive, and in connection with which locality the city is contemplating the building of a municipal belt railway, for which tentative plans have been prepared. La Crosse has five railroads and handles a considerable tonnage as the distributing point for a large section of Wisconsin.

I found evidence, in La Crosse, of a feeling that the city has been "bunked" by efforts heretofore to arouse river traffic interest, and the prevailing attitude seems to be to wait for boats before bothering about terminals. **Even the fact that the government has let contracts for Upper Mississippi barges, to be ready for use next summer, has not satisfied the "doubting Thomases" of La Crosse.**

Among the principal industries of La Crosse are the manufacture of

flour, farm implements, sheet metal products, wagons and tractors. Many of the industrial plants are along the river and could use water traffic to advantage. Among such plants is an extensive flour mill and an establishment now producing twelve tractors daily. La Crosse has a large wholesaling business in groceries and other lines and could receive much of its merchandise by water.

Dubuque presents a striking opportunity for effective harbor development. The city has provided facilities for expediting the handling of traffic on packet boats, but has not yet gone into modern river terminal development. The city, of 46,000 population, has a large industrial activity, is an important distributing point for parts of Iowa and Illinois, and is served by four important trunk line railroads.

The opportunity for harbor development at Dubuque is unique because of a wide slough, with a four-foot depth of water, which extends in a length of two blocks toward the business center of the city. A public street extends along the south of the slough, with a railroad switch track following the water line. On the north side of the slough is a boat-building yard, one of the industries of Dubuque being the building of both steel and wooden boats. The city owns a small part of the frontage on the slough, which would provide an excellent point for the beginning of modern terminal development.

The present river terminal facilities include a municipal dock a short distance below the slough, on the river front. The dock is equipped with a brick warehouse. By means of a piling arrangement alongside the dock, it has been made possible for boats to land at any stage of water. Facilities also are provided to enable teams to drive across the dock, through the warehouse and into the boats. These facilities, however, accommodate only the packet type of traffic. There is no facility for loading or unloading except by hand or by truck. Neither is there any direct rail connection with the dock, although the situation would enable easily a switch siding and rail connections. Dubuque has no definite plans for modern terminals.

Numerous large industrial plants, which could make effective use of barge traffic, are operated on the river front at Dubuque. The industrial activities carried on in a large way are the manufacture of metal products, wood products, boilers, freight cars, boats, flour, machinery. The city also has a large sash and door industry. Two wagon bridges and one railroad bridge cross the river at Dubuque.

Clinton, with a population of 26,000, is about midway on the Mississippi River between Minneapolis and St. Louis. The city is an important point for through freight between Chicago and Omaha and has four important trunk line railroads. There has been no water terminal development at Clinton, although the question has been thoroughly agitated by the Commercial Club, the Manufacturers' and Shippers' Association and various banking interests of the city. A proposal to authorize bonds for the building of a modern river terminal was defeated by the people of Clinton last spring, but it is to be submitted with new vigor at an election this fall.

Clinton has remarkable park development along the river front, opposite the principal business section. Excellent opportunity for modern terminal development is provided by Beaver Slough, to the south of the park. The slough is lined with intensive industrial development, including a large sash and door plant and a sugar refinery. The tentative plan is to develop a modern river and rail terminal at a point between the river and the slough, which location easily could be provided with switch connections with all railroads.

It was called to my attention, at Clinton, that thousands of cattle cars, after bringing cattle from the west for the Chicago stock yards, are returned to Omaha empty, and it was pointed out that these cars could take back an enormous quantity of coal if the coal was brought to Clinton from the Illinois coal fields in barges. The harbor at Clinton is in

excellent shape and could easily be developed.

Water traffic at Clinton could be made an important factor for bringing in coal, iron and merchandise and taking out sugar, sash and doors, engines, structural iron work, boilers, flour and roofing material. The railroad arrangement at Clinton, with all roads concentrating at the river front from near the point of the proposed terminal development make a belt line an unnecessary consideration.

Davenport, Rock Island and Moline, constituting an important industrial community, with a combined population of 100,000, deserve attention as one of the principal Upper Mississippi points. Of the three cities, Davenport alone has constructed modern terminal development, and is at least partly ready for river traffic with modern equipment. At this section of the Mississippi, the river flows from east to west, Davenport being on the north bank and the other two cities to the south.

On a project which, completed, is to cost $750,000, Davenport has expended $300,000. The city has built, along the principal business part of the city, one mile of modern sea wall, reclaiming twenty acres of ground by the filling-in process. The land behind a part of the sea wall was subdivided into twenty-five industrial lots, most of which units are now under lease for warehouse or manufacturing purposes. The lots range from 80 to 110 feet in width, and the depth varies from 68 to 195 feet. These lots front on the sea wall and along the rear are railroad tracks. This completed section extends eastward from about the middle point of the river frontage, and includes a municipal brick and concrete warehouse. To the west is a paved sloping levee for a length of two blocks. West of the sloping levee, which affords facilities for passenger boats, is a park of eleven acres behind a sea wall three blocks in length.

Crane tracks and modern loading machinery have not yet been installed, in connection with the terminal development, but that is a part of the plan, to be carried out as soon as traffic is established. The entire

water front of Davenport is under the jurisdiction of a levee commission composed of the mayor and four citizen appointees, who serve without salary. The receipts from rentals have paid all interest and sinking funds, so that the completed development has cost the taxpayers nothing. These modern facilities, of course, are not yet serving a real purpose, because of the absence of river traffic, but they will make Davenport a big factor when modern equipment begins to move on the Mississippi waterway.

Davenport has plans to proceed with its river front development. An additional two miles of sea wall is to be built, with the reclamation of 141 acres for industrial sites and terminals. **It is estimated that the entire project will yield reclaimed land valued at $2,500,000, to say nothing of the strategic value of the land as a factor for rail and river exchange.**

Rock Island and Moline have totally unimproved levees. Rock Island is unfortunately situated because virtually the entire riparian rights are in railroad possession. The Rock Island Chamber of Commerce now is seeking to have the government establish a harbor line that would enenable sea wall construction and reclamation similar to the work done by Davenport. Two bridges connect Davenport and Rock Island, and Moline is contiguous to Rock Island, on the east.

The three cities, combined, have an immense bulk tonnage, now all moved by three trunk like railroads. Water traffic could take into the three cities a large tonnage in pig iron, oil, grain and coal, and could take out, for shipment up and down the river, immense cargoes of agricultural implements, tractors, wheels, structural steel, gasoline engines, steel trucks, car frames and flour.

Moline is particularly important as a producer of agricultural implements. Mention was made in the preceding article of the experimental trip of taking five barges loaded with agricultural implements from Moline to Minneapolis. Proper terminals and modern barges could relieve the railroads most effectively in the large tonnage of farm implements shipped steadily from Moline.

BETWEEN DAVENPORT AND ST. LOUIS

Between Davenport and St. Louis, along the Mississippi River, six cities are important as factors in possible river traffic as a means of relieving the demand upon railroad facilities. They are important both because of their local industrial activity and because of their function as distributing points for tributary agricultural areas. Only one of the six—Muscatine, Iowa—is ready with a municipal river terminal of a type to invite modern river craft. Another of the six—Alton, Ill.—has a modern terminal for rail and river exchange provided by private railroad interests. Muscatine is the northernmost and Alton the southernmost of the six. The names of the other four points are Burlington, Iowa; Keokuk, Iowa; Quincy, Ill., and Hannibal, Mo. Those cities are entirely without river terminal improvements, although plans for development are in various stages of preparation and interest in river traffic is more or less alive.

As to present boat traffic on this stretch of the Mississippi, it is of the infrequent and irregular variety, carried on in a small way by two packet boats. One operates between Quincy and Davenport, the other between Quincy and St. Louis. The freight handled is inconsequential. The river freight could be made an important factor with modern boat equipment and modern terminal facilities at the cities.

This section of the Mississippi includes the remarkable government dam and lock at Keokuk. The lock is operated free by the government for any craft larger than a rowboat. On the day of my visit at Keokuk, I was able to witness the passing of a packet boat through the lock, which I was told, happens scarcely oftener than once a week. That information in itself, seemed to be rather a striking testimonial of the infrequency of river traffic on the Upper Mississippi. **Considering the massiveness and the engineering excellence of the structure, it seemed pitiful that the machinery should be set in motion only once a week to accommodate a river**

traffic so forcefully eloquent as evidence of a neglected natural opportunity.

Muscatine, a city of 16,000, and the center of an important grain and stock area, has provided an excellent river terminal to accommodate river traffic on a modern basis. The dock is built on a good harbor. It is of the harbor wall construction type, with a substantial platform equipped with crane tracks. Abutting the platform is a warehouse of brick and concrete construction. A railroad switch siding affords direct connection with the three trunk line railroads operating into Muscatine. Excellent team track facilities also have been provided. Muscatine is prepared to install the necessary conveying machinery as soon as modern boats begin the use of the Upper Mississippi.

Muscatine has an important factory industry, chiefly in sash and doors, terra cotta, canning, potteries and brick. Some of the larger factories have river front sites. The city has a large shipping trade, to which river traffic could contribute in large measure.

Burlington, engaged in a large jobbing and wholesale business, and also considerable manufacturing, is merely at the stage of planning river terminal development. The city has 20,000 population. The levee is of the sloping type and unpaved, with poor landing facilities even for the packet type of boat. Modern terminal facilities would enable both direct railroad connections and effective provision for team tracks. The approach from the water front to the business district is short and without any perceptible grade. The city has three trunk line railroads, making it a center for a large productive and consuming area.

A River Terminal Committee of the Burlington Commercial Exchange is at work in an effort to have an official harbor commission appointed, and also is working on a plan for a 600-foot river terminal unit, to be patterned after the Muscatine terminal. The city has riparian rights to a half-mile of frontage along the main business section.

The industrial activity of the city includes the manufacture of Corliss engines, boilers, wood products, wheels, buggies and agricultural implements. Burlington could use river traffic for bringing in pig iron, lumber, coal and oil, and could contribute largely to the traffic with its lines of heavy manufactured products.

Eighteen miles below Burlington is Fort Madison, Iowa, a city of 10,000 population, which has a large lumber mill, an extensive paper mill and large locomotive repair shops. Farm implements also are manufactured. Fort Madison has a river front park, but no river freight terminal.

Keokuk, Iowa, 42 miles below Burlington, has a population of 18,000. The river front is lined with large industrial plants, engaged in manufacturing metal products, lead, zinc, fiber containers, cereal foods, starch, automobile tires, glucose and shoes. The city has riparian rights to seven blocks of frontage along the main business section, but the levee is totally unimproved. The approach from the water front to the business district is abrupt and steep for a distance of two blocks. **The only evidence of river traffic development on the river front is a small frame warehouse to serve the occasional packet business.**

Keokuk is without plans for river terminal development, and interest in such development has not asserted itself strongly, which is surprising in view of the proximity of the government dam and drydocks. The channel is alongside the river, and harbor development would be comparatively a simple undertaking. River traffic could provide Keokuk effectively with pig iron, coal, coke, oil and grain, if modern terminal facilities were available. The city has four trunk line railroads.

Quincy, about midway between Davenport and St. Louis, is a city of 40,000 population on the east bank of the Mississippi. It is a comparatively important shipping point, and also has extensive manufacturing interests. Quincy has gone in considerably for beautification of its river front and development of parks, but the building of river terminals has had only cursory thought. There

are plans but they are indefinite. Quincy has a comprehensive plan for park development along the main stretch of river front, below which, at the edge of an extensive industrial district, it is intended to build a modern river and rail terminal, although not definitely determined upon.

The present boat landing, to serve packet traffic, is an unpaved levee, equipped solely with a frame warehouse, privately owned but built on city property. **The city is considering the purchase and improvement of that warehouse to serve temporarily. Such a step, however, would fail totally to invite modern river craft.** The approach from the present boat landing to the business district is exceptionally difficult for teams and trucks because of a steep grade.

The development of a modern terminal in connection with the industrial district would not be difficult or expensive. Railroad connections could be easily effected and the condition of the harbor makes sea wall construction or reclamation unnecessay. The city owns all the property that would be necessary for such development.

Quincy manufactures extensively in stoves, ranges, engine governors, store fixtures, elevators, power pumps, strawboard; vehicles, cereals, machinery, metal wheels and tractors. The city would make use of river traffic to advantage for inbound pig iron, grain and coal. Quincy is an important distributing point and has three trunk line railroads.

Hannibal, indelibly impressed on the world mind by the thrilling chronicles of Mark Twain, has none of the boating activity that stirred the great humorist. Hannibal has a population of 22,000, manufactures extensively and has four trunk line railroads. The levees at Hannibal is of an easy slope, with a short approach to the business district unmarked by steep grades. One block of the levee has been improved for recreational purposes, but no river terminal has been provided. A committee of the Hannibal Chamber of Commerce, however, is at work

on plans for modern dock development. Hannibal is 120 miles above St. Louis.

The principal industrial development in Hannibal is along the waterfront, the leading manufactured products being stoves, shoes, car wheels, iron castings, structural steel, fence wire, flour, wagons, boilers and boxes. River traffic at Hannibal, with modern terminal facilities and modern boats, could be made an important item.

Alton, on the bank of the Mississippi River, twenty-five miles above St. Louis, is particularly inviting as a river traffic factor because of its extensive railroad connections. The city itself has an important manufacturing industry, but far more important than that is the opportunity offered as an interchange point for rail and river traffic. Alton has a population of 18,000.

The city has not engaged in modern river terminal development, but such activity has been carried on by the Illinois Terminal Railroad Company. As a result, Alton is provided with a modern rail and river terminal unit, equipped with modern machinery for transfer of freight, either bulk or package, directly between boats and railroad cars. A modern warehouse is to be added to the terminal in the near future.

The site of that terminal is not particularly inviting for teaming or trucking purposes, because of a difficult approach, but it is of exceptional strategic value as a point of exchange between boats and railroads. The Illinois Terminal Railroad affords direct connection with all railroads out of Alton, as well as the great network of eastern trunk lines converging at East St. Louis. The Alton harbor, in direct contact with the business district, serves only packet traffic, and has no development other than a frame wharfboat. The harbor, however, would be easily susceptible to modern treatment.

THE ILLINOIS RIVER AND CANAL ROUTE

The Illinois River, with its canal connections, presents an alluring prospect for the prompt development of river traffic on the Mississippi Waterway System as a means of expediting war transportation by taking a part of the load off the overburdened railroads. There are two reasons—and only two—why actual freight traffic on the Illinois River is not today a fact. The principal cities have no modern terminals, and there are no available modern boats. There is a sufficiently dependable channel to enable the traffic, and there is an immense volume of freight that ought to be diverted to such traffic.

It may be stated that the terminals are on the way. Peoria, the largest point on the Illinois, in April voted $250,000 for building terminals and harbor development. The program is to build the first terminal unit this fall. LaSalle, the other principal point on the river and at the head of the navigable portion of it, 260 miles above its juncture with the Mississippi a short distance above St. Louis, also has early terminal prospects. The manufacturers of LaSalle aim to provide a modern terminal there. As to boats, reference might be made to the government's program to provide boats for the Upper Mississippi, and it might be added that the cost of boats for the Illinois river would be a small item alongside some of the government's war expenditures.

Going above LaSalle, and proceeding to Chicago by way of the Illinois and Michigan Canal, there must be added to the foregoing two reasons for the absence of river traffic a third. That is the neglect to provide a usable channel between LaSalle and Lockport—a distance of sixty-three miles.

The situation found to exisit is almost unbelievable, in these times of economic capacity development. There is the evidence of the remarkable engineering feat, which not only gave Chicago its splendid harbor and its deep waterway into the

heart of its industrial environs, but also extended that waterway of 22-foot depth, in direct connection with Lake Michigan, for a distance of thirty-six miles to Lockport. Then there is the Illinois river with its dependable 7½ foot channel from the Mississippi river to LaSalle. And between LaSalle and Lockport is the sixty-three-mile missing link—a waterway, but so impeded with mud that it stands solely as an economic waste.

The explanation of that missing link lies in the state of loggerheads which exists in Chicago, and in Illinois generally, among waterway exponents, and dates back to the lakes-to-the-gulf deep waterway days. Illinois has been nursing a $20,000,000 program to provide at least a fourteen-foot channel between Chicago and the Mississippi river, the idea being a continuous waterway for lake boats, ultimately to reach the Gulf of Mexico. In the meantime, considerably less than one-tenth of that contemplated expenditure would provide a six-foot or seven-foot channel between Lasalle and Lockport. **In fact, a decidedly small expenditure would clear the Illinois and Michigan canal sufficiently for the type of modern river barges which the government is to put on the Upper Mississippi next year. There could then be actual river traffic between Chicago and the Mississippi river.**

It is now probable that the government will provide this missing link. Appeal has been made to the War Department to perform the necessary dredging work. War transportation expediency, therefore, may open this important part of the great waterway system.

Another canal enters into the situation. Thirteen miles below LaSalle, the Hennepin Canal branches to the west from the Illinois River and connects with the Mississippi River just below Rock Island. That canal—a 75-mile waterway of 7-foot depth—was built primarily to enable Chicago to have waterway traffic with Rock Island and Davenport. There was traffic, for a while, but the 63-mile missing link is as essential to that route as it is

to the Illinois River route. Consequently, the Hennepin Canal now is virtually unused. It is more than likely to continue unused until Chicago gets down to the practical present and decides upon the expediency of engaging in river traffic with river boats, instead of holding out for a lake boat channel. River traffic would be good business for the immediate future, and it would not preclude the lake-boat channel program for the distant future.

As to present traffic on the Illinois River, it may be dismissed quickly. It does not exist as a real factor in the movement of freight. One packet line operates twice a week between Peoria and St. Louis. A small packet boat makes a daily trip between Peoria and LaSalle. Small package freight, such as produce, groceries, hardware and genral merchandise, with an occasional small shipment of hogs and cattle, constitute the traffic. There is a total absence of bulk movement by water. Stops are made by the packets at half a dozen intermediate points, where unimproved gangplank landings are the only invitation extended to river commerce.

There is one evidence of barges on the Illinois River. At Pekin, ten miles below Peoria, two private companies, in connection with grain elevators, operate barges for collecting grain from nearby communities. They have modern landings, and the grain is unloaded by the suction process. In this instance, however, the barge movement is merely a substitute for team hauling and does not relieve any demand on railroad facilities. The grain, after being gathered, is shipped out of Pekin by rail.

Peoria has a frontage of ten miles on the Illinois River, 180 miles above its mouth. The city has a population of 66,000, ranks seventh in the United States as a primary grain market and second in corn, is the distributing point for a large area in central Illinois, has a large annual railroad tonnage, and engages in varied manufacturing industry on

a large scale. Peoria has eleven trunk line railroads.

Along the main portion of the river front, Peoria has developed a waterfront park on a plot of ground 1,400 by 200 feet. The city owns a contiguous tract of the same size which is to be utilized in the development of a modern river terminal. Peoria's comprehensive program provides for extensive reclamation work and the building of four terminal units, at different points along the river front. **The first unit is to be built this fall by use of a part of the bond issue which has been mentioned. The bond issue, incidentally, was overwhelmingly approved by the people.** The site of the first unit is such as to enable easily an effective arrangement of rail connections and switch sidings. The plan calls for modern conveying machinery for the transfer of freight between river and rail.

At the present time, to accommodate packet traffic, Peoria has only an unimproved levee, at which the ancient landing is effected. The condition of the harbor is excellent, the channel of the river being alongside the city. North and south of the main business district, along the river front, is considerable industrial development, to which river traffic ought to prove attractive. Peoria seems fully anxious for the earliest possible development of regular boat lines with modern equipment. There is a conviction more or less general, however, that a part of Chicago's tonnage will be needed to justify adequate equipment and maintain regular sailing schedules on the Illinois River.

Due to the enterprise of one of its industrial concerns, Peoria, last year, engaged in a noteworthy experiment in long-haul river traffic. That concern, incidentally—the Keystone Steel & Wire Company—has gone to a large expense to make the river available for its use. With its plant on a site one mile inland, the company bought a strip of land of 640 acres and built a canal a mile long. Last summer the company leased some barges and towboats and one each of two trips

carried 12,000 tons of pig iron from Sheffield, Ala., on the Tennessee River, to the dock at the door of the Peoria plant. The pig iron had been hauled by rail the short distance from Birmingham to Sheffield.

In two respects, the experiment was a success. **The upriver trip was made in ten days, as against fourteen days for the same haul by rail. It also thoroughly demonstrated that movement of pig iron by river for long distances is feasible.** The practice was not pursued, however, because of the inability of the company to get proper boat equipment. The experiment was made with the best obtainable barges, which did not measure favorable after the second trip. The company is now contemplating the use of oil barges to get oil by river from St. Louis. The concern ships considerable tonnage to points in the south and is ready to use the river route as soon as modern boats are available.

Briefly analyzing the latest available tonnage figures of Peoria, covering 1916, it is possible to gain some idea of the freight the city could divert to river traffic. In the year mentioned, Peoria's total grain receipts amounted to 56,000,000 bushels. That included 3,440,000 bushels of wheat, 37,164,000 bushels of corn, 11,728,000 bushels of oats, 629,000 bushels of rye and 3,333,000 bushels of barley. The aggregate inbound tonnage of all freight for the year was 7,141,350 tons, and the outbound freight totaled 5,500,875 tons. In the year, Peoria shipped 2,105,000 tons of coal, 2,000,000 barrels of flour, 28,000,000 bushels of grain and a considerable quantity of bulk meat and potatoes. Peoria received 124,000 tons of iron, 635,000 barrels of oil and 185,000,000 feet of lumber. All of that freight was moved by rail. It indicates big possibilities for modern river equipment.

LaSalle is virtually one community with Peru and Oglesby, the three cities having a combined population of 24,000. The industrial interests of the three cities are combined in the Illinois Valley Manufacturers' Club. That organization, thoroughly interested in developing river

traffic, is at work on plans to perfect an incorporation for the purpose of providing the community with an initial river terminal. Plans for the terminal have been prepared. It is aimed to build a unit at a cost of $75,000, the money to be subscribed by the manufacturing interests. The first unit is to be 250 feet long, 80 feet wide, and fully equipped with crane, warehouse, rail connections and team tracks. The complete plans call for three such units.

On the day of my visit in LaSalle, the directors of the organization were meeting with three railroad representatives from Chicago, who had come in a response to a request submitted to Regional Director Aishton, in an effort to work out details of a joint terminal arrangement among the three trunk line railroads in LaSalle, in connection with the proposed river dock. The manufacturers, I learned, are determined to build an independent belt line if the joint arrangement does not succeed.

LaSalle and its contiguous communities have extensive manufacturing industries, chiefly in zinc, chemicals, cement, clocks and agricultural implements, and there is a large coal mining industry. The annual freight movement, all by rail, is in excess of 6,500,000 tons. The leading commodities for which water traffic could be used to advantage are zinc ore (inbound) and cement, coal, rolled zinc, spelter, agricultural implements, clocks and clay products as outbound tonnage.

Chicago, for the time removed from immediate river traffic possibilities because of the neglected canal which already has been described, is 400 miles above St. Louis by the Illinois river and canal route, and is 187 miles from Davenport and the upper Mississippi by the Hennepin canal route. It is needless to go into detail, with respect to Chicago's industry and commerce, to point to the enormous freight contribution Chicago could make to the Mississippi Waterway System, if the Illinois and Michigan canal were made fully navigable for modern river barges. A few references will serve the purpose.

Chicago has tremendous industry

in steel ship building, and in the various manufacturing lines in iron, steel, wood, leather, brick and chemicals. In livestock, grain, provisions and lumber, Chicago's trade is the largest of any city in the world. Chicago's shipments of packed meats, flour, grain and heavy manufactured products reach astounding proportions. Its annual output of foundry products, steel products, railroad cars, clothing, electrical machinery, lumber products and furniture is figured in tens of millions of dollars.

Chicago is not strange to water traffic. The city's industry is fully alive to the value of the lake for transportation. Immense tonnage in hard and soft coal, iron ore and grain is received by lake boat. Chicago ships, by lake boat, enormous quantities of grain, oil, manufactured iron, merchandise and millstuffs. **Chicago needs only to recognize, in its easy access to the great inland waterway. an opportunity for further water traffic, in order to lend itself to the needed diversion of freight from rail movement to river movement.**

How much of Chicago's export could move by the river system to New Orleans, it may only be conjectured. The tremendous export is a fact, and the waterway is an existing facility. Chicago's immense freight movement now adds to the clog along the eastern trunk lines and in the terminals of the Atlantic ports. The great inland waterway is a virtually unused war asset.

PRINCIPAL POINTS ON THE MISSOURI RIVER

Investigation of river traffic conditions on the Missouri River has been interesting because it has revealed an instance of modern river terminal equipment actually in operation—the first of the kind on any part of the Mississippi Waterway System above St. Louis. Furthermore, it has disclosed modern barges operating on schedule. Kansas City, Mo., provides that sample of river traffic on a modern basis. The terminal referred te is a municipal enterprise. The barge line is one established by the business interests and shippers of Kansas City.

The head of any form of navigation on the Missouri River is Fort Benton, approximately 100 miles above Bismarck, N. D. It is a striking circumstance that that uppermost 100 miles of navigable channel on the Missouri River should be the route of a unique boat line, operated with clock-like regularity. Between Bismarck and Fort Benton, a line of five gasoline boats, each of 100 tons capacity, is operated on a regular schedule from May to November. Those small boats, it is claimed, rarely carry less than their full capacity of general supplies on the upriver trip and grain on the return to Bismarck.

As constituting the principal points which might be expected to contribute to a full-fledge river traffic on this important tributary of the Mississippi, the cities found are Kansas City, St. Joseph, Omaha and Sioux City. Between Sioux City and Bismarck are two not insignificant South Dakota cites, which possibly may figure in future river traffic. They are Chamberlain and Pierre.

In addition to the modern barge line at Kansas City, which operates between that point and East St. Louis, and the unique gasoline boat line at the head of navigation, to only other evidence of boat traffic to be found on the Missouri River is a small packet and barge line which makes two round trips weekly between Omaha and Decatur, Neb., 110 miles up the river and slightly more than half the distance to Sioux City.

The municipal dock at Kansas City, of modern construction, is 600 feet in length. The platform, 50 feet wide, is equipped with a crane track and a hoisting crane of five-tons capacity. Abutting the platform, along one-half its length, is a steel and concrete warehouse. Alongside the other half of the platform are two switch tracks, directly connected with the Kansas City Terminal Railroad, and thus in communication with all railroads entering the city. The two loading tracks accommodate nine freight cars at one time. Paved team track facilites are provided in connection with the warehouse, with a sliding door arrangement enabling dispatch in delivering or taking away freight.

At the time of my visit at the dock, a barge had just arrived from East St. Louis with a 287-ton cargo. It was a 600-ton barge, but the cargo had been limited, due to a low stage of water. **The hoisting crane was at work, picking up twenty-five kegs of nails at each dip into the barge and setting them upon a small truck.** The dock is not equipped with machinery for direct transfer between barge and railroad car, or between barge and warehouse, hence small trucks are used to complete the transfer. Later inquiry developed that the city experts, within a short time, to provide conveying machinery. The dock was built out of the proceeds of a bond issue of $75,000 authorized in 1910, and $20,000 is still available for additional equipment.

While the kegs of nails were being transferred into waiting freight cars, half a dozen teams and auto trucks were engaged in calling for or delivering freight at the warehouse doors. The warehouse contained all manner of package freight, including a considerable consignment of boxed pianos which had been brought to Kansas City by boat.

Kansas City leases space in the warehouse, and wharfage privileges

are extended to boat lines for rental on a tonnage basis. During the operation of the dock, the revenue thus derived has paid all maintenance expenses.

The dock, at present, is used by the Kansas City Missouri River Navigation Company, which operates on a weekly round trip schedule between Kansas City and East St. Louis, a river haul of 408 miles, making occasional stops at ten or twelve Missouri cities. Among those intermediate points, Jefferson City and Boonville have cobblestone levees. The other cities have only mud landings. At no intermediate point is there evidence of modern terminal development.

The navigation company was financed for $1,000,000 in 1910 by Kansas City business interests. Eighty per cent of the capital stock was subscribed during the first month after the project was launched. The company operates with two towboats, three 600-ton barges, two 900-ton barges, and four open deck 250-ton barges. The barges are of steel construction. **The rate for the river haul from East St. Louis to Kansas City is 80 per cent of the rail rate, and the switching charge for door delivery, up to a maximum of $9 a car, is absorbed.** The company has through bill-of-lading privileges for river-rail shipments, much of the freight carried being direct rail to river or river to rail transfer at the East St. Louis terminal.

The barges used by the company are constructed particularly for light draught, and unloaded draw only eighteen inches of water. The loading capacity is gauged entirely by the river stage. It is not unusual for the barges to encounter sandbar or shallow water difficulties, due to the fact that the government's program authorized in 1910, to provide, by spending $2,000,000 a year for ten years, a dependable six-foot channel from the mouth of the Missouri river to Kansas City, has lagged and suffered delays. The work, after more than seven years, has been only about 40 per cent accomplished. The channel often, during the navigation season from March to November, has a depth of

only three to four feet. The effort even was made, in 1915, to discontinue Missouri River improvement, but the showing made by the Kansas City company of its persistence to continue navigation succeeded in keeping the program on the books, although it has fallen behind schedule.

The business of the company, since the war, has not exceeded 50,000 tons a year. The tonnage is low because of embargoes on eastward movement, because of delays in getting freight cars at East St. Louis, and because of the inability to handle bulk business. **It is of paramount importance that Kansas City add to its dock equipment, as speedily as possible, facilities for handling bulk cargo, if even the available boat equipment on the Missouri River is to serve its full capacity in relieving rail congestion and expediting war transportation.**

The barge line could handle a large volume of traffic in coal, iron and grain if such facilities were available. At present, all forms of package freight are carried, including grain in sacks and live stock.

The Kansas City dock, at present, is not easily approachable for teaming or trucks because of a steep grade for three blocks and numerous railroad crossings at grade. The franchise contract between the city and the Terminal Railroad, however provides for two viaduct approaches to the dock, the work now being held up due to war conditions. Kansas City owns a half mile of river frontage at the site of the dock, which is centrally located, so that room for expanded development is available. The city also has another tract of river frontage a short distance to the east.

Kansas City is a significant factor in the development of water traffic because of its importance as a packing and grain center, also because of the network of eight trunk line railroads which makes the city a distributing point for a large area. The city has thirty-three grain elevators, with a capacity of 11,000,000 bushels. It is second in importance in the country as a packing center. Various lines of manufactured commodities are produced in large

measure and could add materially to an augmented river traffic. Among the leading products are packed meats, flour, canned meats, cereal foods, machinery, castings, plumbers' supplies, clay and stone products, cement and textiles.

In Kansas City, Kas., contiguous to the Missouri city, the packing house industry is operated along the Kaw River, but an unhappy combination of circumstances makes the use of barges impracticable. At times the river is too low for the barges, and when the water is sufficiently high the bridges are too low to permit barge passage underneath.

St. Joseph, Mo., eighty-seven miles above Kansas City by river, is a city of 85,000 population. It is an important wholesaling and jobbing point for a large section of Kansas. St. Joseph has no river terminal and no boat traffic. The river front, in its present state, is totally without landing facilities, except under most difficult circumstances. The St. Joseph Commerce Club has a river committee busily engaged, however, in seeking to arouse the business interests and municipal authorities to river activity.

It is aimed, in St. Jospeh, to eliminate the example of Kansas City and organize among the business interests a barge line to operate to Kansas City; also to induce the city to build a wharf, as a municipal enterprise. The city owns a river frontage of 250 feet, centrally located and easily approached, and contiguous to terminal railroad tracks. It is proposed to buy 600 feet of inundated land, adjoining, which is held at an inconsequential price, and by the process of reclamation to provide space for a more extensive river river terminal development. **This procedure becomes necessary because St. Joseph, due to extreme generosity with railroad interests, has permitted most of its river front to be entirely bottled and many of its streets leading to the river to be totally closed.**

St. Joseph hopes that by carrying out this program, the government may be induced to extend its Missouri River channel development above Kansas City. In high water

there is now sufficient channel for traffic to St. Joseph, but as a general rule the channel is uncertain due to a constant shifting of sand bars.

St. Joseph has an important packing industry, with an $80,000,000 annual output, and assumes some importance as a grain and milling center. Six trunk line railroads enter the city. St. Joseph could contribute extensively to river traffic.

Omaha is a city of 204,000 people, 200 miles above Kansas City. The city has extensive smelting industry, is important as a packing and milling point, manufactures agricultural implements on a large scale, is an important shipping and distributing center, and does a large wholesaling business. Omaha differs from most river cities in that its main business street paralleling the river is sixteen blocks back from the water front, and a section eight blocks deep along the river is totally given over to industrial and railroad development. Along the river front are extensive industrial establishments and a virtual network of railroad switching yards. The river front is accessible from the business district along only one street and that passage is difficult because of a steep grade and numerour railroad crossings.

Omaha owes its limited river traffic activity to the initiative of a group of business men. The muncipality has done nothing to develop river terminals, further than to reserve a tract of river frontage north of the above described section for possible future development.

Business men of Omaha joined, three years ago, with business men of Decatur, Neb., 110 miles up the river and with a population of less than 1,000, in financing a boat line. Decatur was interested because it was not in direct touch with a railroad. With one 150-ton steamboat, equipped with bins for bulk shipment of grain and for carrying livestock and sufficiently powerful to tow a loaded 250-ton barge in addition to carrying its own capacity load, with one wooden barge, and with one 150-ton gasoline packet, the company has operated on a reg-

ular schedule, and last year handled 500 carloads of freight. The business is not conducted privately for profit, but the real aim has been to pioneer for river traffic and demonstrate its feasibility on the upper part of the Missouri River.

It is being planned to extend the service, with modern equipment, up to Sioux City and down to Kansas City. The boat line carries grain and livestock on the down-river trip and takes lumber, coal and merchandise freight on the return to Decatur, serving also intermediate farm communities. Decatur stipulates river delivery in ordering merchandise from Omaha concerns.

A grain elevator, to serve the boat line, has been provided at Decatur, and one with a modern bulk conveyor is being built at the Omaha terminal. The present terminal facilities at Omaha include a small frame warehouse, built on land leased from railroad interests, an electric spiral conveyor for transferring bulk grain directly from barge to railroad cars, a water front side track, and a crude livestock chute. **I was informed, while at Omaha, that the Decatur elevator then held between 250,000 and 500,000 bushels of grain awaiting river transportation to Omaha.**

The importance Omaha could assume as a factor in river traffic may be judged from figures for last year, showing a smelter output of $59,000,000, livestock receipts of 7,500,000 head, grain receipts of 66,000,000 bushels, a packing output of $192,000,000, and a wholesaling business of $236,000,000. The tonnage of Omaha is handled by eight trunk line railroads.

Council Bluffs, Io., geographically, is across the river from Omaha, but the city has failed totally to build up within a mile of the river, and to discuss it as a river traffic factor at this time would be futile.

Sioux City, Io., on the east bank of the Missouri River, 200 miles above Omaha, with a population of 70,000, is to be considered as a potential river traffic factor because of its rapid recent growth commercially and industrially. Sioux City has no river terminal development and no regular boat traffic. The city, however, owns the necessary river frontage for terminal development, and is holding it for that purpose. The attitude at Sioux City toward river traffic seems to be to wait until regular service is established up the river to Omaha.

Sioux City should enter as a factor in developing river traffic as a measure of relieving the load on the railroads because it has an extensive packing and milling industry, manufactures on a large scale in alfalfa products, and through five trunk line railroads distributes to a large agricultural area spread over parts of Iowa, Nebraska and South Dakota.

On infrequent occasions, cattle and hogs have been brought to Sioux City from Chamberlain, S. D., 400 miles up the river, by boat. I was told that hogs so shipped had been received in excellent shape, with less shrinkage than occasioned by railroad transit, and in shorter time. On those occasional trips, the boats always have found it possible to return to Chamberlain with full cargoes of general supplies.

ST. LOUIS DISTRICT AS A CENTRAL POINT

St. Louis, with East St. Louis and contiguous communities directly across the Mississippi River, is a point of particular importance with respect to a study both of river traffic conditions and river traffic possibilities on the Mississippi Waterway System because of a series of reasons. It is the uppermost point on the system where even a sadly limited water traffic begins to reveal tonnage computations. It is an industrial and commercial district of such scope as to present immense possibilities for diverting freight from railroad to waterway in order to expedite war transportation. It is the point of division between the Upper Mississippi and Lower Mississippi, as recognized by the government. It is the greatest railroad center directly in contact with the Mississippi River. It is in direct communication with New Orleans and the Gulf of Mexico by a waterway that provides a channel with minimum eight-foot depth. It is in the close proximity of the junctures of both the Illinois River and the Missouri River with the parent trunk line of the waterway system.

Existing river traffic at St. Louis is low in tonnage, and is inconsequential in nature with respect to actual war transportation. The boats engaged in large majority are of antiquated type. The terminal facilities, in general, are inferior. There are samples of highly efficient terminals, privately owned, but the existing municipal facilities are not such as to sustain a high character of river traffic on a modern basis. St. Louis has plans, and an available appropriation, for a beginning of proper river terminal development, but the work on those plans has moved slowly.

Even the limited river terminal facilities in the St. Louis district, properly co-ordinated, could be made ready to serve effectively a water traffic of sufficient proportions to make it a real factor in war transportation. Those facilities include two privately owned docks of modern type, in connection with

both of which modern steel barges now are operated; a municipal dock with a limited provision of modern machinery and with direct railroad connections; numerous inclines to enable direct unloading from freight cars to barges; a levee of considerable length, provided with wharfboats of the type to serve packet traffic; half a dozen water front grain elevators, with a combined capacity of slightly more than 4,000,000 bushels.

St. Louis has a frontage of nineteen miles along the west bank of the Mississippi River. Opposite the central part of St. Louis is East St. Louis, with a water frontage of slightly more than a mile. To the north of East St. Louis is Venice, and leading away from the river are Madison and Granite City. All are important factors in the combined industrial activity of the St. Louis district.

The principal water frontage of St. Louis, with respect to the main business district, is approximately the middle mile, extending between the Eads Bridge and the Municipal Bridge. That frontage is a levee of the old type, with a string of wharfboats providing landing facilities for river packets. The levee is totally without modern devices and has no railroad connections. Packets are loaded and unloaded by hand. The most frequent evidence of river traffic on the levee is a cargo of apples, in barrels, piled in the open on the cobblestone slope.

The only method of carrying freight to or from the wharfboats is by team or truck, and that is an expensive, difficult and slow process. The levee is approached by difficult street grades, for a distance of four blocks, and the levee itself is a sharp slope.

There is a municipal dock, more or less used heretofore, on the St Louis side of the river, about a mile north of the levee just described, at O'Fallon street. It is a frame structure with a platform 250 feet in length along the water line. The platform has a track both for a hoisting crane and for railroad cars. Behind the track is a warehouse, 200 by 40 feet. The dock is equipped with an electric crane, which en-

ables transfer of freight between barge and platform, or directly between barge and railroad car. This dock was used last year by the Inland Navigation Company, which operated a self-propelled steel barge between St. Louis and New Orleans.

The O'Fallon street dock is not so constructed as to expedite boat operation at all stages of water, and in low water particular difficulties are presented. **Use of this dock by teams or trucks is extremely difficult, because of the proximity of various railroad freight yards and twenty or more railroad crossings on the street leading to the dock.** The grade of the street also is difficult. The dock has direct railroad connections with St. Louis railroad terminal facilities and could be used, at least temporarily, as a point of exchange between rail and river traffic.

The two modern docks referred to are on the east bank of the river, across from St. Louis. One is that of the Kansas City Missouri River Navigation Company, which operates steel barges between that terminal and Kansas City. Detailed reference to that boat line was made in the preceding article of this series. The other is a private dock, owned by the Aluminum Ore Company, which operates a line of sixteen steel barges for bringing aluminum ore up the river from Memphis, and also operates a railroad belt line to provide direct connection between the dock and all railroads out of the St. Louis district.

The dock of the Kansas City Missouri River Navigation Company is 176 feet long and 80 feet wide, placed at right angles to the river. It is equipped with modern conveyors for handling package freight to and from barges. It also has machinery for handling heavy freight expeditiously. It has direct railroad switch connections. The dock of the Aluminum Ore Company is of thoroughly modern type, and is particularly of strategic value, because of its direct railroad connection. The inclines referred to could be made to afford facilities for direct transfer of freight between cars and barges. They enable running cuts

of four to six freight cars alongside barges. With the present facilities, however, the actual transfer, although expedited, would have to be by hand or truck.

An important feature of present water front facilities at St. Louis consists of half a dozen grain elevators which, with moderate repairs and equipment, could be made to serve effectively a large grain movement by river.

It is at once evident, in visiting these elevators, that their use, originally concerned with river traffic, has been diverted to railroad transportation. Being both on the river front and on railroad tracks, excellent opportunity for exchange between rail and river traffic is afforded. Four of the elevators are on the St. Louis side of the river and the other two are on the east bank. The storage capacity of the six elevators is 4,350,000 bushels.

St. Louis has extensive plans for modern river terminal development. It is purposed eventually to provide a series of terminal units, at various points along the river front, and effectively located with respect to manufacturing and shipping districts. The city recently acquired possession of river-front terminal tracks and the comprehensive river terminal plan calls for extending the municipal belt system to connect all docks effectively with the various railroads.

Work on the first of the proposed river terminal units is now under way, although it has been seriously delayed and is not yet in a state which promises early completion. The site of the dock unit is at a point about two miles north of the present wharf-boat levee, at North Market street. The approach to the river front, at that point, is along an even grade, but one of the problems to be overcome is the network of railroad grade crossings which would make the approach extremely difficult for team movement.

St. Louis has appropriated $750,000 for the building of this initial dock. The program is to build first a single unit of 300 feet in length, the total North Market street dock

ultimately to consist of four such units, with a total dock length of 1,200 feet. The dock is to be fully equipped with modern machinery, warehouse, railroad connections and team track facilities. The first step in the work has been the building of a piling wall and reclamation of land by filling in. While it was announced, at one time, that the dock was to be ready for use during the present navigation season, the work has not yet begun to assume definite shape.

Inasmuch as the site, plans and appropriation have been available, there seems little excuse for the delay to which the city administration has subjected the development. It was pointed out in the first article of this series that government agencies have approved the building of river terminals by cities, as a war measure, and it is essential that St. Louis speed up the work on its first modern municipal river terminal. St. Louis is in a fortunate position with respect to ownership of sufficient river frontage for extensive terminal development. The principal engineering problem to be met concerns approaches to the water front over the net work of railroad trackage.

The present river traffic at St. Louis includes, in addition to the two barge lines which have been mentioned, an occasional packet up the Mississippi to St. Paul, making intermediate points, with light package business; packet traffic up the Illinois River to Peoria; packet traffic down the Mississippi to Memphis; packet traffic up the Ohio and Tennessee rivers. The Aluminum Ore Company, which operates primarily to bring up ore from its terminal across from Memphis, now is undertaking to develop merchandise traffic for its own down river movement—a trip which otherwise must be made empty.

Reference to tonnage figures in St. Louis for last year at once will reveal the utter insignificance of the present river traffic. The combined inbound and outbound tonnage during the year, for instance, amounted to 76,278,039 tons, of which only 150,380 tons was carried by water. **Less than one-fifth of 1 per cent of**

the freight tonnage into and out of St. Louis was carried on the river. Right along with that startling disclosure, attention may be called to the results of a compilation recently made, covering a period of twelve years, in each year of which the tonnage into and out of St. Louis carried by railroads approximately parallel to the river regularly exceeded 50 per cent of the total tonnage, notwithstanding which fact the river traffic itself constantly ranged less than 2 per cent of the total tonnage. **This at once discloses the total decadence of river traffic at St. Louis and the remarkable opportunity presented for diversion of freight from the overtaxed railroads to the water route, if boats and terminals are made available.**

As indicating that the river is not used by St. Louis in even a measure of its possibilities, it may be cited that St. Louis last year exported to Cuba, Mexico, Central America and South America, 357,700 barrels of flour, and yet only 5,880 barrels moved from St. Louis over the Lower Mississippi. St. Louis exported to the same countries, to which the Mississippi water route to New Orleans affords a direct avenue, 879,000 bushels of wheat, and yet the wheat movement from St. Louis over the Lower Mississippi amounted to only 34,000 bushels. That meant a load for railroads which should have been borne on the Mississippi.

The St. Louis district last year shipped 190,000 tons of dressed beef, but only 11,000 tons moved by water, over the Upper Mississippi and Illinois rivers.

The situation with respect to the handling of cotton from the South is even more striking. **St. Louis received last year, both for local use and for trans-shipment, 1,042,783 bales of cotton. Only 2,500 bales came to St. Louis by water.** A corresponding situation could be shown for each item of heavy tonnage in the traffic of St. Louis, the net result being, as already given, that less than one-fifth of 1 per cent of the large tonnage of the St. Louis district last year moved by river.

The immense, diversified industry of the St. Louis district, the fact of its importance as a leading primary grain market, its magnitude as a

packing center and its large volume of business as a distributing point for all forms of merchandise testify to the possibilities of establishing river traffic of large proportions to and from St. Louis. The manufacture of steel products, railroad and street cars, shoes, woodenware, tobacco, various metal products, stoves and ranges, steel castings and foundry and machine shop products, electrical products, railway supplies, enameled and galvanized ware, drugs, paints, vehicles and implements is carried on in extensive measure in St. Louis. In some of these lines, St. Louis is the leader among all manufacturing points.

Last year, St. Louis received more than 85,000,000 bushels of grain, and shipped 66,000,000 bushels. Wheat receipts totaled 30,000,000 bushels, and the shipments, including an export of 3,000,000 bushels, totaled 25,000,000 bushels. St. Louis received 3,893,000 barrels of flour, manufactured 1,619,000 barrels, and shipped 5,412,000 barrels, including an export of 696,000 barrels. St. Louis has ten public and thirty-two private grain elevators, with a combined capacity of 9,500,000 bushels, and six flour mills with a daily capacity of 8,600 barrels. Cattle slaughtered in the St. Louis district last year amounted to 952,000 head.

St. Louis has large tonnage receipts in pig lead, pig iron, zinc, spelter, cattle, hogs, sheep, cotton, wool and hides. Shipments are heavy in machinery, steel casting, chemical products, wooden products, shoes, tobacco, grain, flour and a dozen other items. The volume of traffic into and out of St. Louis is taxing twenty-six railroads, aided by a joint local terminal system. The river is virtually an ignored opportunity. The possibility of using that river system to release the load on the railroads and expedite war transportation is almost without limitation.

PITTSBURG DISTRICT AND THE UPPER OHIO

Along the Upper Ohio River above Cincinnati, including the Monongahela and Allegheny rivers at its source, and the Kanawha River branching to the south through West Virginia, is found extensive barge traffic, particularly in the handling of coal. It is a localized traffic, however, moving only over small stretches of the waterway. Furthermore, it is not common carrier traffic, but it is the result of individual industrial plants or coal companies engaging in water transportation with their own lines of barges and towboats, solely to accommodate their individual businesses.

The possibilities for water traffic from the section penetrated by the Upper Ohio, over the length of the Mississippi Waterway System, are enormous, due to the immense industry in heavy iron and steel manufacture which lines the river for scores of miles, and to the huge coal production. There is, however, a total absence of river traffic of the character which would indicate direct communication between that section and the various other sections along the Mississippi system.

The coal barge traffic referred to is of large proportions. In addition thereto, the only river traffic along the Upper Ohio is packet business, operating as short links in a chain. There is no handling of bulk freight in barges by any boat lines operating as common carriers.

As points of first importance along the Upper Ohio are Pittsburg, at the very tip of the Ohio; Wheeling, W. Va., ninety miles below the river's source; and Cincinnati, 468 miles below Pittsburg. There are other points which enter as river traffic factors, including Charleston, W. Va., on the Kanawha River; Steubenville, Ohio, twenty-four miles above Wheeling; and Marietta, Ohio; Parkersburg, W. Va., and Maysville, Ky., along the Ohio between Wheeling and Cincinnati.

The absence of through river traffic is blamed on the delay which has marked the government's work in completing the program of canal-

izing the Ohio River. **This work, between Pittsburg and Cincinnati, includes the building of thirty-six dams, the program for the entire Ohio involving fifty-four dams.** In numerical order down the Ohio from Pittsburg, the first sixteen dams are completed and in operation. Beyond that point, some of the dams are almost completed, some are completed, some have been just begun, and others have not been begun. The lack of continuity in completing the dams, it is pointed out by river traffic exponents along the Upper Ohio, has failed to make any extended part of the river available for continuous navigation. The canalization work is to give the entire Ohio a nine-foot channel to Cairo and the Mississippi River.

Pittsburg is an important factor in considering traffic possibilities on the Mississippi Waterway System as a measure of war transportation, because of its large production of iron, coal, coke and manufactured steel, because of its strategic location with respect to waterway avenues, and because localized river traffic there is an existing factor of considerable proportions.

The commercial center of Pittsburg is at the point where the Monongahela and Allegheny rivers join to form the Ohio River. The city is spread along both sides of each of the three rivers. As to existing traffic, the Monongahela furnishes even more striking evidence than that found on the Ohio. In considering this point as a factor in river traffic, it is necessary to deal not solely with the city itself, but with the so-called metropolitan district of Pittsburg, which is of remarkable and unbroken extensiveness.

The Pittsburg district, in a measure, corresponds to the Twin Cities at the head of potential navigation on the Mississippi River. Here is found the head of another great branch of the waterway system. The district, by water, is approximately 1,000 miles above the mouth of the Ohio, at Cairo, and virtually twice that distance above New Orleans by water route. The contrast between the Pittsburg district and the Twin Cities district, however, is more

striking than the similarity in geographical position. **While the head of the Mississippi offers to waterway transportation its great stores of grain and food products, the Pittsburg district has its immense volume of bituminous coal, its iron, its coke and its heavy products in steel.**

Pittsburg has neither modern municipal river terminals nor early plans for such terminals, but, as pointed out to me while I was at Pittsburg, such municipal development is not essential to starting actual river traffic on a modern scale, because scores of the large industrial plants along the river have terminals which at once could expedite barge traffic. The municipal terminals, of course, should follow, in order to make river traffic fully available to all shipping interests. The city, while more or less crippled by railroad interests with respect to river frontage, during recent years has undertaken to acquire river front property and now possesses sufficient frontage for a beginning of modern terminal development.

The commercial water frontage of Pittsburg lies along the north bank of the Monongahela, beginning at its point of juncture with the other two rivers and extending eastwardly for seven or eight blocks. That constitutes the city's public levee. The only development for boat-landing purposes is a frame wharf-boat, owned by a company which operates freight packets between Pittsburg and Wheeling. The levee itself is a steep slope but the approach from the business district is without difficult grade. The opposite bank of the Monongahela, in striking contrast, is marked by a precipitate hill of rock towering 400 feet above the water's surface. The narrow available ledges are used by railroads.

It is the levee just described which provides the limited facilities for the existing packet traffic. The levee is without direct railroad connection and all loading and unloading are done by hand, with teams and trucks as the transporting medium.

The more impressive river traffic activity, however, is found elsewhere. Along all three rivers, through Pittsburg, are found towboats and coal

barges, with modern unloading machinery at work. As has been said, however, that traffic is localized. By the building of dams and locks, the Monongahela has been made navigable for a distance of 130 miles above Pittsburg. The first fifty miles is an almost unbroken chain of huge industrial plants, engaged in iron, steel and heavy machinery manufacture. Similar industrial development has been begun along the Allegheny, for which a canalization program also is projected.

The Monongahela penetrates through the great wealth of coal fields in Western Pennsylvania and West Virginia, and it is between those coal fields and the steel industries and furnaces of Pittsburg that an immense river traffic in coal barges is operated. **According to available reports, the coal traffic on the Monongahela, during the last two years, exceeded 25,000,000 tons, That traffic is claimed to have saved the Pittsburg industrial district from idleness last winter when the railroads were helplessly unable to meet transportation demands.**

One of the large steel plants on the Monongahela—a subsidiary of the United States Steel Corporation—is building seventy steel barges, some of them self-propelling, I was informed, solely to carry coal from West Virginia mines to the plant. Most of the barges now engaged in this coal traffic are of wood. The coal not only is carried to plants on the Monongahela, but the traffic extends to plants on the Allegheny and on the Ohio below Pittsburg.

Formerly, it was not uncommon for barge trains of coal to move from this district down the Ohio, throughout its length, and also down the Mississippi to New Orleans. That traffic, however, has been totally suspended. The government's work of canalizing the Monongahela, to make the heavy coal traffic in the Pittsburg district possible, cost less than $6,000,000.

A phase of waterway activity which is commanding particular attention in Pittsburg concerns a proposed plan to connect the Ohio River with Lake Erie by canal. A bill for the proposed canal has been introduced in the house at Washington.

The plan is to use the Beaver River, which connects with the Ohio twenty-eight miles below Pittsburg, the Mahoning River up to Niles, Ohio, and then construct a canal between Niles and Ashtabula, on Lake Erie. The total length of the canal would be 101 miles, half to be constructed and half to be derived by canalizing the Beaver and Mahoning rivers. Engineering investigations and computations on this project have been completed. It is estimated that the cost would be $60,000,000, and that the work could be completed in three years.

Pennsylvania is pressing for this project through a state canal board. The chief interest of the Pittsburg district, in the proposed water avenue, would be the opportunity to bring down iron ore and take up coal, entirely by water. The route would give Pittsburg (in fact, the entire Mississippi Waterway System) direct water connection with Lake Erie over an avenue slightly more than 100 miles in length, which, in conjunction with the canalized Monongahela, would mean that the immense iron and steel industry of the Pittsburg district could get its entire requirements of coal and ore exclusively by water.

It was pointed out to me, while at Pittsburg, as a basis for urging the construction of this canal at the present time, that if the war should last for five years, the canal, completed in three years, still could be an important factor in war transportation. Accepting the hypothesis, the proposition as a war measure seems sound, **but resort to hypothesis becomes totally unnecessary to establish the soundness as a war transportation measure of promptly taking every step to make the greatest possible use of the existing water avenue on the Ohio River, and, through it, the entire Mississippi waterway.** It is not intended, at all, to attempt to discourage the proposed Lake Erie and Ohio River Canal, because such a connection undoubtedly would be a forceful addition to the inland waterway facilities of the nation, for all time. The foregoing observation is made, however, because of the attitude shown in Pittsburg last year toward establish-

ing a boat line on the Ohio, which will be referred to in detail presently.

Last year's aggregate freight tonnage into and out of Pittsburg is reported at more than 177,000,000 tons. The production in coal was 98,000,000 tons, in coke was 23,000,000 tons. in pig iron was 10,000,000 tons, and in finished steel was 6,000,000 tons. With common carrier barge lines, Pittsburg could ship much of its heavy production by river. The extreme localization of the barge traffic in and about the Pittsburg district is shown by reports, which reveal that **while, in five or six years, Ohio River traffic, as a whole, has dwindled from 14,500,000 tons to less than 9,000,000 tons, the coal traffic on the Monongahela has grown from 6,000,000 tons to more than 13,000,000 tons.** That, of course, reflects the cessation of shipping coal down to Memphis and New Orleans. The production of bituminous coal in West Virginia, Pennsylvania and Ohio, in regions directly tributary to the waterway system, amounts to 250,000,000 to 300,000,000 tons annually.

Wheeling has an industrial situation largely similar, on a smaller scale, to that at Pittsburg. The river is lined with extensive steel and iron industries, both on the Wheeling side and across the river. The industrial development, in fact, is virtually unbroken between Wheeling and Steubenville, twenty-four miles up the river. Wheeling, also, is the center of numerous contiguous municipalities, all constituting, in fact, a single industrial district.

Wheeling's municipal levee is wholly unimproved for terminal purposes. The only facility is a privately owned wharf-boat. The approach to the river front for teaming purposes is easy.

Wheeling furnishes, however, a striking instance of determination to put boats on the Ohio river. Last December, the Wheeling Commercial Association succeeded in staging a meeting of representatives of the various river municipalities between Parkersburg and Pittsburg. Plans were adopted for the financing of a $500,000 river transportation company. Of the capital stock, Wheeling and Pittsburg each was to subscribe $150,000, with the remainder divided pro rata among the various

lesser municipalities. **It was on that occasion that the Pittsburg commercial interests failed to disclose a keen interest in making use of the existing Ohio facilities.** Wheeling had subscribed its $150,000, but Pittsburg did not respond. Pittsburg's failure had an echo in the lesser communities. **The interests in Wheeling, however, determined to use the money they had subscribed, with the result that the Liberty Transit Company of Wheeling is now beginning the operation of two boats on the Upper Ohio.** The boats were purchased at New Orleans, and are of the packet freighter type. One is to make two round trips weekly between Pittsburg and Parkersburg, and the other is to make a weekly round trip between Pittsburg and Cincinnati. At the Pittsburg levee I saw one of the boats loading with merchandise freight for its initial trip in the new service. It is the intention of the company to add towboat and barge equipment as quickly as possible.

In the Wheeling district, similar to the activity found in the Pittsburg district, individual industries make use of towboats and barges for transportation between mines and plants, or from plant to plant, as a strictly localized traffic.

Cincinnati has a diversified industry and its contribution to long haul river traffic would consist largely of package freight. The present river traffic at Cincinnati, aside from packet traffic, consists of a comparatively heavy coal movement between the mines of West Virginia along the Kanawha River and private coal operators of Cincinnati. Six coal companies have large coal elevators on the Cincinnati river front and operate private towboat and barge lines between their elevators and the Kanawha River coal fields. The coal thus received at Cincinnati last year was almost 1,500,000 tons, or about 10 per cent of all coal receipts. These coal elevators are equipped with modern devices for unloading the coal barges. There also are, along the Cincinnati river front, three or four sand and gravel companies which operate individual barge lines for short hauls.

The municipal levee at Cincinnati —the city's sole landing place for

public river traffic—is wholly unimproved, rough, a long abrupt, slope, extending about three blocks along the river. There is no municipal dock or wharfboat, but four private wharfboats are operated to accommodate packet business. The present packet traffic is a line up the river as far as Pittsburg, a daily packet to Louisville, 136 miles down the river, and occasional packet service with Charleston, by way of the Ohio and Kanawha rivers. The line to Louisville connects at Madison, Ind., with a packet line which operates between Madison and Frankfort, Ky., on the Kentucky River.

LOWER OHIO RIVER AND ITS TRIBUTARIES

Freight traffic along the lower part of the Ohio River is limited almost exclusively to that of the old type of river packets. The packets are more in evidence than on the Ohio above Cincinnati, or on the Upper Mississippi above Cairo; and they move with more or less regularity, but the traffic still fails to assume proportions as a real factor in the movement of freight.

The principal cities along this section of the Ohio, together with the Cumberland and Tennessee tributaries, are without modern river terminals. In most cases, plans are on foot for the building of such terminals, but the work has not been begun. The traffic continues to be of a comparatively localized character, moving between points in short jumps. The only direct communication between the Ohio and the Mississippi, in the way of regular traffic, is a packet line that operates between St. Louis and points on the Tennessee River, traversing the Ohio, in its course, for a distance of about fifty miles, between Cairo and the mouth of the Tennessee.

There is no barge traffic on the Lower Ohio, with the exception of occasional local movements. Barges are not engaged, however, in the movement of bulk freight. **The conditions found along this section of the Ohio indicate a remarkable opportunity for use of barge lines as a means of aiding materially the heavy war transportation. There should be a heavy movement of tonnage throughout this length of the Ohio and into the Mississippi, both to the north and the south.**

Louisville, Ky., is the first Ohio River point of outstanding importance below the section dealt with in the preceding article of this series. By river, Louisville is approximately 600 miles below Pittsburg and almost 400 miles above the mouth of the Ohio at Cairo. The present river traffic at Louisville consists of a daily packet to and from Cincinnati; daily packet service to Madison, Ind., fifty miles up the river; two packets each week to Evansville,

Ind., and intermediate points, and on rare occasions a train of coal barges from the West Virginia coal fields along the Kanawha River. Such coal barge trains were more frequent arrivals in former years, but the traffic has dwindled to inconsequence.

Louisville receives a large tonnage of grain, cotton, coal and iron, and ships a large tonnage of tobacco, agricultural implements, cooperage products, saddlery and stoves. **All of that tonnage is moved by rail. A large part of it could move by river, if boats were available and proper terminals were at hand.** The city has nine railroad trunk lines, and is a distributing point for a large area of the South. There is also a considerable export business, for which river traffic could be employed. Last year showed a through railroad movement of more than 14,000,000 tons, 5,600,000 tons inbound for local use, and an originating outbound tonnage of more than 3,000,000 tons. Louisville manufactures largely in agricultural implements, elevators, machinery, cotton products, saddlery, tobacco, stoves and wagons.

Evansville is 180 miles below Louisville, by river. This Indiana city is an important point in manufacture and also distributes to a large section of Indiana and Kentucky. It also has a comparatively important export business. The city is the center of a large coal-producing territory. There is an extensive trade to the south, which particularly indicates prospects for waterway traffic.

Present river traffic at Evansville, in addition to that with Louisville, includes the following: Two boats operating between Evansville and Bowling Green, up the Green River, which joins the Ohio nine miles above the city; a boat making a daily round trip to Owensboro, Ky., forty miles up the Ohio; two round trips weekly to Paducah, Ky., on one of which trips the boat proceeds forty miles up the Cumberland River to Tilene, Ky. Occasionally, coal is brought by barges from Newburg, Ind., fifteen miles up the Ohio. There is a total absence of traffic between Evansville and the Mississippi River.

Evansville has improved a part of its river front with an attractive park, but nothing has been done to aid river traffic. The levee is totally unimproved, although such improvement would be comparatively a simple matter. The approach to the levee is without grade. **In contrast with the city's unimproved levee, the Louisville & Nashville Railroad, on a three-block strip of frontage immediately below, has an incline track along the water's edge to enable direct handling of freight between freight cars and boats at varying stages of the river.** A small amount of freight from the Green River is handled there. The incline is without unloading machinery.

The annual tonnage at Evansville, moved by five trunk line railroads, approximates 2,000,000 tons inbound and 1,500,000 tons outbound.

Evansville is particularly important as a hardwood lumber market. It has numerous saw mills. The manufacture of furniture is an important item. The city also is a manufacturer of stoves, plows, buggies, cotton goods, tools and gas engines. **Cotton is received from Memphis and other points in the South, finished iron from Pittsburg, pig iron from Alabama. Those commodities all arrive by rail, although the waterway offers an avenue for them. Evansville exports furniture, steam shovels and headlights, stoves and many other manufactured products are shipped to the South, but the movement is all by rail, not by river.**

Paducah, Ky., not important in population, is, nevertheless, a point of interest with respect to river traffic because of its position at the mouth of the Tennessee River, and its nearness to the mouth of the Cumberland River. River packets at Paducah are daily visitors, because of that position. The city has only an unimproved, sloping levee, along the Ohio River immediately below the mouth of the Tennessee. A large private wharfboat, with two driveways for teams, affords the principal accommodations for the packet traffic. A short distance below the levee, which is approached on a level by the main street of the city, is a railroad incline somewhat similar to that described at Evansville. That incline is used for the

transfer of lumber and ties from packet boats to railroad cars. A similar railroad incline is used at Metropolis, Ill., across the river from Paducah. All merchandise freight, however, is handled through the wharfboat, and live stock received is driven across the wharfboat and up the leevee.

Along the waterfront, near the levee, Paducah has a large grain elevator, a case factory, and various wholesale and commission establishments. Yet, there is no means for efficient use of river traffic by those establishments. **It is a peculiar circumstance that such establishments, built virtually on the river front, should have highly modern railroad terminal facilities and no indication of boat terminals.**

Nashville, Tenn., is the principal point on the Cumberland River. The city lies on both sides of the river, and is about 258 miles above the river's mouth, near Paducah. There is a more or less inconsequential packet traffic on the Cumberland, in both directions from Nashville. Two lines operate packets up the river, for a distance of 180 miles, taking out merchandise to various agricultural communities and returning with cargoes of produce and live stock. One packet makes one round trip a week to Paducah. **The irregularity of river traffic, as carried on by the average packet, may be gathered from the fact that at the time I was in Nashville, the packet supposed to be operating regularly between Nashville and Paducah had made an upriver trip, merely because the opportunity for taking a cargo in that direction had presented itself.**

The present levee at Nashville is a difficult slope, and the surprising fact is that effort is made at all, by shippers, to deliver goods to the packets, which calls for a most difficult operation of teams or truck.

Nashville receives pig iron from Alabama, cotton from Memphis, heavy steel from Pittsburg. The entire movement is by rail. A large part of it, if not all of it, could be by river. Nashville manufactures extensively in hardwood lumber, flour, stoves, structural iron, saddlery and furniture. A small amount of lumber is

received from the Upper Cumberland by boat. The city has three trunk line railroads.

The government has expended $5,500,000 in canalizing the Cumberland River. With the completion of two more dams, the river will offer opportunity for all-year-round navigation. Nashville should make ready promptly with a modern terminal, in view of that work by the government. **Modern terminal development is imperative before boat traffic can be handled sucessfully at Nashville. The levee has not even a wharf-boat, and teams now must stand in line, waiting to get up to the gang-plank of the packet.**

The Tennessee River is used only for light packet traffic in package freight, live stock, lumber and produce. Three communities, at a point 325 miles above Paducah, offe. an important prospect of river traffic development on the Tennessee. They are Florence, Sheffield and Tuscumbia, in Northern Alabama. It is at that point that pig iron easily could be taken from Birmingham by rail, a short and direct haul, and transferred to barges for shipment to the various river cities which now draw heavily upon the Birmingham iron supply. The government has given that locality an impetus for activity, recently, by establishing there an immense nitrate plant, operated by water power. There is packet service between that point on the Tennessee and St. Louis, including stops at the various intermediate points.

Cairo, Ill., is the point of contact between the Ohio and the Mississippi. Because of that position, more than because of local conditions, Cairo is a strategic point in considering river traffic possibilities.

The levee at Cairo is on the Ohio River side, the city lying almost a mile back from the Mississippi. Along one mile and a half of the Ohio River side, the city has a concrete wall, built for protection against floods. The top of the wall is at the 60-foot stage on the Cairo guage. Outside of the wall is an unimproved levee, affording ineffective landing facilities for packet boats. In addition to stops by the various packet lines already mentioned as operating

to or past Cairo, there is a dock for the Cotton Belt Railroad, which operates a ferry betwen the Cairo levee and its railroad terminal on the Missouri side of the Mississippi. There is no barge traffic at Cairo. **Although much of the grain moving out of Cairo moves to the South, it is carried by rail. It is a peculiar fact that Cairo has large grain elevators on the river front, used only in connection with railroads.**

Cairo has had plans prepared for a modern river terminal. The plans call for six blocks of development, to include five separate warehouse and terminal units. The city now is negotiating for acquisition of sufficient river frontage to build the first unit of the proposed terminal. The entire river frontage is privately owned. The plan, if carried out, would give Cairo a highly efficient terminal, with railroad connections.

LOWER TRIBUTARIES OF THE MISSISSIPPI

With the sole exception of an inconsequential logging movement, the lower tributaries of the Mississippi River are devoid of freight boat traffic. The three principal tributaries are the White and Arkansas rivers, cutting across Arkansas diagonally from the northwest section of the state, and the Red River, making a similar diagonal cut across Louisiana. Two cities of importance, besides numerous lesser communities, are along these tributaries. Little Rock is in about the center of Arkansas, on the Arkansas River. Shreveport is in the northwest corner of Louisiana on the Red River. The White River, to the north of the Arkansas, extends through important agricultural and lumber sections, and joins the Mississippi a short distance above the mouth of the Arkansas.

The two principal cities mentioned are totally without river terminal facilities, neither have they definite plans for providing terminals. Both cities owe their existence to their positions on rivers, both formerly were totally dependent upon river commerce, both in former years carried on an extensive river traffic. In both cases the traffic has completely disappeared. Now, however, there is activity in both cities aimed at re-establishing river commerce. Both cities could be important factors in diverting tonnage from the railroads to river barges as a means of increasing the war transportation facilities.

Little Rock, on the south bank of the Arkansas River, is an important jobbing and wholesaling point, and more recently has begun to assume importance as an industrial center. With North Little Rock across the river, the Arkansas capital has a population of 85,000. It is a leading cotton center and an important lumber market.

The river front at Little Rock is wholly unimproved, for commercial purposes. **It is a striking circumstance that a continuous line of industrial establishments and wholesale houses should parallel the river, and yet be wholly oblivious to the**

river as a traffic avenue. The approach to the river front, except the immediate slope at the levee, is almost level from the business district. Terminal development on the Little Rock side of the river would not entail difficult or expensive operations. On the opposite side of the river the situation is less favorable, due to a condition of sand bars and lowlands.

A short distance above the sand bars, however, there is a sharp rise of rock bluffs, at the first foothills of the Ozark Mountains. A United States Army post, Fort Logan H. Roots, overlooks Little Rock from the heights of those bluffs. It would be difficult to seek a more picturesque panorama of a river city than that of Little Rock from the high promontory of rock. The state capitol is a striking high point in the picture. But a closer attention to details along the water's edge spoils the effect of the picture. That discloses the unimproved mud levee, with almost no evidence of boat-landing facilities. The only river craft to be seen is an excursion packet and a few small boats.

Little Rock recently had an engineer prepare a plan for a continuous and circuitous park system. It included a commendable proposal for beautifying the river front of the city. But the plan ignored totally the commerical value of the river as a means of transportation.

It was through the Arkansas River that Little Rock was established in 1721. There was found the first rock formation, in exploration of the Mississippi from its mouth to the mouth of the Arkansas, and up the tributary. It was due to boat traffic on that river that Little Rock grew into a trading point and the leading jobbing center of its state. But dependence upon railroad facilities, in Little Rock, has become complete. The river is unused.

Four bridges connect Little Rock and North Little Rock. The two cities are virtually a single community. The government has done much to add to the growth of the city. Nearby has been established one of the National Army cantonments—Camp Pike. Just recently the government decided to build a

$10,000,000 picric acid plant at Little Rock, and the buildings now are being constructed. It is particularly essential, therefore, that Little Rock should make use of its opportunity for river commerce—a navigable tributary which puts the city in direct communication with the Mississippi River.

Little Rock has five trunk line railroads, with numerous branches, forming a network spread over Arkansas. **The city receives a large tonnage annually in all lines of commodities from St. Louis, Chicago, Kansas City, Pittsburg and other important points on the Mississippi River system, but the tonnage all arrives by rail.** Little Rock's wholesaling business is particularly large throughout Arkansas in groceries, hardware, dry goods, drugs and machinery.

The Arkansas capital is an important manufacturer of cotton seed oil, producing approximately 4,000,000 gallons annually. The city also manufactures in large measure in furniture, bauxite, mattresses, wood products, hardwood flooring and overalls. Little Rock's receipts in cotton last year exceeded 236,500 bales. A large part of it was exported, but it moved entirely by rail to the seaports. The city has six cottonseed mills, with sixty-three presses, and five cotton compresses.

Above Little Rock on the Arkansas River, at the western boundary of Arkansas, is Fort Smith, an impotant jobbing center for extreme Western Arkansas and a part of Oklahoma. At present it might be difficult to carry on navigation up the Arkansas to Fort Smith for any great part of the year, but ultimate development of the waterway system should mean added transportation facilities for Fort Smith.

Shreveport is at the head of the navigable portion of the Red River, in the extreme northwestern corner of Louisiana. The city is only twenty miles from the Texas line and forty miles from the Arkansas line. Naturally, Shreveport is an important jobbing and wholesaling point for parts of the three states.

The Red River is totally without boat traffic. Shreveport has not the

slightest sign of river terminal development. The water's edge through the city is in the same state as elsewhere through agricultural country. By river Shreveport is 307 miles above the mouth of the Red River.

It is in comparatively recent years that boat traffic on the Red River to Shreveport died. **At one time the boat traffic was extensive. There were regular boat lines connecting Shreveport with New Orleans, Natchez, Memphis and St. Louis. In 1905 the traffic began to dwindle. In 1910 only one boat from the Mississippi River arrived at Shreveport. The railroads had exterminated the service.** No more conclusive proof that an important volume of freight could move on boats on the Red River is needed than the fact that railroads parallel the river on both sides, from Shreveport to the river's mouth. Despite the death of boat traffic on the Red River, the government continues its snagging operations and keeps the channel clear for possible navigation.

There was a reawakening of interest in river traffic possibilities at Shreveport about two years ago. In March of 1917 an engineer was employed to report on the feasibility of navigation. He reported, after making a boat trip throughout the length of the river below Shreveport, that a five-foot channel was available for year-round dependable navigation.

One outgrowth of that activity was the organization of the Red River Navigation Company among business interests of Shreveport, incorporated with a capital stock of $40,000 for the purpose of establishing a boat line on the Red River. The people of Shreveport, at a subsequent election, authorized the assessment of a tax to provide a bonus for the transportation company as soon as boats actually are in operation on the Red River. Some of the largest manufacturers of Shreveport are among the stockholders of the company. There has been delay on the part of the company about actually getting boats into operation, however, and the city has been

slow to take up the question of providing a modern river terminal.

Above Shreveport, spreading into Texas from the Red River, is Caddo Lake, a part of which has been made navigable, with a four-foot channel, by a government dam. I was able to learn at Shreveport that a local concern had experimented successfully with the manufacture of pig iron from ore from northeastern Texas, and that movement of Texas ore into Shreveport by barge was being considered as a possible water traffic development. Shreveport uses no coal, having a supply of natural gas which at present seems to be unlimited.

Shreveport has eight railroads. Last year's freight tonnage amounted to 772,000 tons in receipts and 668,000 tons in shipments. The wholesaling and jobbing trade of the city amounted to $78,000,000. The city is comparatively important as a cotton market. Last year 170,000 bales of cotton was received, a part of which was exported. **It is a striking fact that Shreveport, in exporting cotton, ships it by railroad to Atlantic seaports, instead of using the short river route to New Orleans.**

Shreveport is an important lumber point and water transportation could be used effectively for taking lumber into the city, from many of the Louisiana saw mills. As a manufacturer, Shreveport produces fertilizer, glass, stock and poultry food, saw mill machinery and castings, carbon black, mill work and electrical fixtures. The city has a large oil refining business.

The lower tributaries of the Mississippi ought to be used extensively for the movement of all lines of wholesale commodities from the Mississippi River to the distributing points in Arkansas and Louisiana. There ought to be an important movement of cotton and lumber on those tributaries. It is only the absence of boats and terminals which leaves those tributaries as unused and wasted facilities. The freight is at hand—freight which at present is loaded entirely on the railroads.

THE CITIES ALONG THE LOWER MISSISSIPPI

Evidence of the almost total decadence of boat traffic on the Mississippi Waterway System becomes complete with the result of investigations at the principal points along the Lower Mississippi. Below Cairo, there is almost 1,000 miles of water avenue with a dependable channel of nine-foot depth. At the end of that avenue is an outlet to the sea and the trading ports of all the world.

Along that stretch of waterway are points acting as important distributing centers, in all lines of merchandise and manufactured products, for extensive agricultural areas. Each of those points is an important cotton market and a busy lumber center. Each one is an exporting city. Yet, the Lower Mississippi is without through boat traffic for the handling of freight. There are packet lines operating between points separated by short distances. There are saw-mill localities where tow-boats and barges are busily employed carrying lumber, in the raw state, from nearby points to mills. **But there is no approach to an expeditious movement of freight by boats along the Lower Mississippi. There is no movement of bulk tonnage to New Orleans for shipment to meet the needs in the European battle zone, with the single exception of a line of oil barges operated by the Standard Oil Company.**

Perhaps the most startling circumstance is that one section of the Lower Mississippi is devoid even of the limited packet service—one link missing even in the chain procession of small jumps.

The principal cities along the Lower Mississippi are without modern municipal river terminals. In most cases, plans for such terminals are under way, but the fact is, nevertheless, that along this main trunk of the great waterway system which now ought to be serving an immense purpose in war transportation, modern barges scarcely could be of capacity service if they were available, because of the absence of proper terminal facilities. This statement does not refer to New Orleans, which will be dealt with separately in the

succeeding article, but it is true of the cities that lie along this great water trunk line between Cairo and the city at the gateway to the Gulf of Mexico.

Coupled with the evidence of a decayed boat traffic and a pitifully neglected opportunity to expedite war transportation is no less striking evidence of immense waterway possibilities. While the factors of barges and terminals are absent, the factors of freight and justification of its diversion to the waterway are forcefully present.

Of first importance among the points referred to is Memphis, 230 miles by river below Cairo. Two river traffic links, one of potential significance, connect Memphis with the Upper Mississippi. There is a packet line operating on a once-a-week schedule between Memphis and St. Louis. The freight handled necessarily is of inconsequence, in comparison with gross tonnage. Of more moment, however, is a line of steel barges operating between the same two points. They are operated by the Aluminum Ore Company of East St. Louis for carrying Arkansas bauxite from a modern ore terminal across the river from Memphis to the company's plant across from St. Louis.

The effort now is being made to develop commercial freight for these barges on the down-river trip, which otherwwise must be made empty. This line has a modern terminal, with railroad belt connection, at the St. Louis end. In delivering freight at Memphis, the barges use a private river terminal and warehouse. The equipment consists of facilities for conveying freight to a warehouse at the top of the levee slope, where railroad connections are available. Modern unloading machinery is absent, however, and freight must be trucked from the boats to a floating dock and there loaded on the conveyors. Hand unloading again is necessary at the top of the incline.

The municipal levee at Memphis is totally without modern development. There are three private wharf-boats, one of them of steel and concrete construction, but the difficulties of hand unloading and teaming on a sloping cobble-stone levee have not been removed. Nearby is a water-

front coal elevator, formerly used for coal carried by river from Pittsburg, but the traffic has ceased and the elevator is unused.

Memphis, fortunately, is about ready to begin the building of a modern municipal river terminal. The people voted approval of a bond issue of $500,000 for the purpose, and a bid at par and a bonus has been received. Actual sale of the bonds is awaiting approval of the Capital Issues Committee of the Federal Reserve Board. Such approval in all probability will be obtained as soon as the definite plans for the terminal are presented, as was the case with respect to the municipal river terminal at Minneapolis.

There is a large amount of barge traffic in lumber carried on by sawmills at Memphis, but that is solely for gathering raw lumber from nearby localities. Aside from the lines to St. Louis, the packet traffic at Memphis moves up the river for a distance of eighty miles and down the river to Rosedale, Miss., 125 miles distant, with Helena, Ark., the principal intermediate point. The packet traffic brings in cotton and livestock and takes out merchandise freight.

There also is a varying amount of irregular packet traffic into Memphis from points within a range of 100 miles. There is no traffic at Memphis, however, from the Ohio River, or from the Mississippi above St. Louis. Memphis gets no part of its large tonnage originating at Pittsburg, Chicago, Minneapolis or St. Paul by river. Memphis, an important exporter of cotton and lumber, sends nothing by water to New Orleans.

Memphis handles more than 700,000 bales of cotton annually. A small part of it is brought in from short distances by packet boats. No part of it, however, moves out by river, although almost all of it is reshipped, either to the factories of the east or to ports for export. Memphis gets much of its coal from the **Illinois coal fields, yet it does not come by river. Virtually all of it could be brought by boat from Cairo.** Memphis, for its large jobbing business, gets immense tonnage from

Chicago and St. Louis. Virtually all of it is brought by railroad. All of the heavy manufactured iron from the Pittsburg district is brought by railroad. River traffic could be made the important factor in all of that movement, to relieve the railroads in the present heavy war transportation.

Memphis has an excellent cotton warehouse and railroad terminal. It is only a short distance back from the river. It has capacity sufficient for 75 per cent of the cotton handled at Memphis. A short canal would give that terminal direct water traffic connections. Such a canal could divert an immense amount of cotton tonnage, outbound from Memphis, to river traffic.

Memphis has diversified manufacturing industries. There is a large manufacture of cotton seed products, hardwood lumber products, saw mill machinery, stock food, bags and automobile wheels. The lumber industry is of vast importance, there being twenty-eight hardwood saw mills inside the city and forty-six in the surrounding environs. There are eleven distributing yards and nine wholesale firms. Lumber could be made an important item of river traffic.

In its publicity circulars, the Memphis Chamber of Commerce boasts of "The Mississippi River, Equal to a Hundred Railroads." That may be a measure of its possibilities, but Memphis scarcely has made it equal to one railroad.

At Vicksburg, Miss., packets are operated about 100 miles up the river to Greenville, Miss. It is between Greenville and Rosedale that the missing link of about fifty miles in even the limited and broken packet boat traffic occurs. Down the river, packet boats operate between Vicksburg and Natchez, Miss. From Natchez, other packets operate to Woodville and Baton Rouge. The last link in the chain is from Baton Rouge to New Orleans. When it is borne in mind that the schedules of these various packet lines are more or less uncertain, and that they operate infrequently and irrespective of one another, the total absence of any possibility for through move-

ment of freight, with present facilities, is understood.

The levee at Vicksburg is on a canal, cut after the Mississippi River, in 1874, changed its course and deserted the city. The levee is totally unimproved and calls for a most difficult climb of two blocks by team or truck traffic. In contrast with the city's levee is the government dock and levee construction plant at Vicksburg, where every device of a modern river and rail terminal is found in operation.

At Natchez is a cable incline somewhat similar to that described with reference to Memphis. After freight is unloaded from boats to a barge dock, it is loaded on cars and hoisted by cable to a warehouse at the top of a steep bluff. That terminal is a private enterprise. It is used for cotton and lumber. The city's levee is without equipment, and the approach from the levee to the city is up a steep roadway. Natchez, however, is engaged in formulating a plan for a modern river terminal, under the leadership of the Natchez Chamber of Commerce.

Both Vicksburg and Natchez are important centers for cotton and hardwood lumber and are export points in both lines. Natchez has several large cotton mills. Both of these Mississippi points also are important jobbing centers and receive large consignments of merchandise and manufactured products from points on the upper branches of the Mississippi Waterway System. Helena, Ark., sixty miles below Memphis, also is preparing to provide a modern river terminal, to cost $100,000.

A sample of actual barge traffic on the lower Mississippi is that carried on by the Standard Oil Company, from its pipe line terminal, across from Memphis, to New Orleans. Export oil is carried in large quantities on a line of tank barges, owned by the company. For the general movement of freight, however, the Lower Mississippi is totally unequipped.

NEW ORLEANS GATEWAY TO PORTS OF WORLD

As the gateway port between the extensive water avenues of the Mississippi Valley and the lines of ocean traffic, New Orleans commands attention of the first order, in considering the possibilities of using the Mississippi Waterway System as a means of war transportation. Because of the remarkable water terminal facilities which have been provided at New Orleans, the attention thus commanded assumes a degree of absorbing interest. Following the study of plans, projects and possibilities at one city after another along the various branches of the great inland waterway system, the inspection of material evidences of terminal efficiency at New Orleans has afforded a cause for extreme gratification. It has been like finding something after a long search.

Due to seventeen years of public harbor activity at New Orleans, this series of articles, dealing with two-score cities along the Mississippi Waterway, need not conclude without picturing the reality of modern terminals, prepared for modern river traffic on the Mississippi and its tributaries.

New Orleans virtually is ready for any number of modern barge trains that may be put on the Mississippi Waterway System to take from the overburdened railroad facilities of the nation a portion of the immense tonnage of grain, flour, cotton, iron, coal, manufactured products and the dozens of other commodities which must be moved to meet the combined war and domestic needs.

Both public and private water terminal facilities are present in extensive measure at New Orleans. They are of the type to bring together, in an expeditious movement of enormous freight tonnages, a vast aggregation of river barges, railroad trains and ocean steamers.

The public facilities at New Orleans are these:

Six miles of wharves and warehouses, equipped with eighteen immense steel sheds.

A cotton warehouse and terminal

of reinforced concrete construction, with a present storage capacity of more than 200,000 bales, and equipped to handle 2,000,000 bales annually.

A grain elevator—almost a miracle of modern water terminal ingenuity —of reinforced concrete construction, with a capacity of 2,622,000 bushels, capable of loading grain on ships at the rate of 100,000 bushels an hour, and equipped to unload grain from river barges at the rate of 60,000 bushels a day and from railroad cars at the rate of 200,000 bushels a day.

A municipally owned and operated belt railroad, connecting all of the extensive wharf facilities and the ten trunk line railroads operating into and out of New Orleans.

Supplementing these public facilities to serve water traffic are railroad and industrial wharves, elevators and warehouses. Adding the private development to the public facilities indicated, New Orleans has modern development along almost nine miles of its river front. The combined public and private facilities have storage capacities for more than 5,000,000 bushels of grain and in excess of 470,000 bales of cotton.

The public water terminal facilities at New Orleans represent an investment of approximately $15,000,000. They are the property of the State of Louisiana, provided, maintained and operated under the jurisdiction of the Board of Commissioners of the Port of New Orleans, commonly known as the Dock Board. The public belt railroad is municipal property, built, maintained and operated by the public belt board, composed of New Orleans business men. Both of these extensive sets of facilities, co-ordinated to serve effectively together, have been produced by the use of revenues from small beginnings—they do not represent assessments against the taxpayers.

Even a more striking development to be added to these facilities is now under way. New Orleans is building an industrial canal, almost six miles in length, through the city, to connect the Mississippi River with Lake

Pontchartrain, a large arm of the Gulf of Mexico. Two purposes will be served by this canal. It will open a better and shorter route between the city and the gulf. Even of greater importance than that to New Orleans, however, will be the opening of an immense industrial district in direct contact with water commerce.

Dredges are at work on this canal. They are working from the middle in both directions. Any doubt of its promptly becoming an actuality is removed by a striking evidence of faith in the undertaking. A ship building company is erecting a large plant on the route of the canal and has orders to build ships which must be launched by the beginning of next year. The plant is now two miles from navigable water. That means that the portion of the canal from the plant to Lake Pontchartrain is to be ready for use by next January. The entire canal is to be completed by January 1, 1920. The cost is to be $6,000,000. There is to be a lock at the river end of the canal, to give the canal permanently a depth of thirty feet. The ultimate result of this development, including numerous slips on both sides of the canal, will be, without question, extensive additions to the warehouse, terminal and industrial waterfront facilities at New Orleans.

The foregoing is a brief indication of the manner in which New Orleans has made use of its waterfront. **The city is 110 miles above the mouth of the Mississippi River, but it is a seaport, in every sense of the term.**

Possibly it should be pointed out that river traffic possibilities were not always the incentive which actuated New Orleans in providing waterfront facilities. The wharves and steel sheds clearly were designed more directly to expeditte exchange between railroads and ocean steamers. In the more recent development, however, (the cotton terminal and the grain elevator) the possibilities of river traffic have entered as a guiding factor. Provisions have been made specifically to handle modern river barge traffic.

The numerous wharves, with their steel shed equipment, quickly can be made ready for an extensive river

traffic. Only the installation of hoisting cranes and conveyors, on platform tracks already in place, will be necessary. That equipment has not been provided hitherto because ocean freighters carry their own loading equipment, while river barges are dependent upon wharf devices. I was assured that the Dock Board will provide the necessary equipment as soon as the river barges appear, and to any extent needed.

The Dock Board also is prepared to add more than five miles of wharves and sheds to the present facilities. The board has jurisdiction over forty-one miles of river frontage, on both sides of the river. The platform landings at the present wharves are five feet above the high water.

Harbor depth is never a question of concern at New Orleans. Along the sides of the wharves the depth ranges from 40 feet to 100 feet. In midstream the depth exceeds 200 feet in places.

Every wharf has direct railroad connections on the public belt line. About 65 per cent of the area of the public wharves is under cover. The total area of the public wharves, available for handling commodities, exceeds 4,000,000 square feet. The Dock Board's report for the last fiscal year shows revenue of $970,945 and expenses of $899,401, leaving a net profit of $71,544. **Neither the wharves nor the public belt railroad are operated for profit—the purpose is to expedite and increase the commerce of New Orleans.**

The public grain elevator may be said to be the last word in modern water and rail terminals for handling grain. It is totally fireproof, and operated entirely by electrical power. It is equipped with a modern dust-collecting system. Without attempting a technical description of the equipment, it may suffice to state that the plant is complete for storing grain, for caring for it, for weighing it, for sacking it, for loading it to ships, for taking it from railroad cars or boats, or for transferring it directly between barges and ships or railroad cars and ships. There is a pneumatic suction conveyor for unloading grain from river barges. The storage portion of the elevator is a series of cylindrical concrete

bins, the space between the cylinders also being formed into separate bins, so that no space is wasted. The minute completeness of the plant may be indicated by stating that the equipment includes a device for taking the temperature of the grain in any bin at eight foot intervals. The wharf is 1,500 feet long.

The cotton warehouse and terminal, immediately adjacent to the grain elevator, is a companion product of modern water and rail terminal construction. The two public plants occupy approximately a mile of river frontage, a short distance above the business center of the city. Work on the wharf of the cotton terminal still is in progress. It is to be completed in time for the fall cotton crop. Four warehouse units have been completed. Each unit is composed of thirty or more compartments, and each compartment will store 1,600 bales. Two additional units are under construction. The terminal includes also a compress building, equipped with four highly modern compresses.

The terminal has extensive railroad trackage, operated by the public belt, to expedite transfer. Each warehouse compartment has electrically operated cranes. The equipment of the terminal includes also motor tractors for carrying cotton between wharf and warehouse. The plant is equipped with a sprinkler system which, added to the concrete construction, has resulted in an extremely low insurance rate. The wharf is 40 feet wide and 2,000 feet long, carrying two tracks, and a wharf house of two stories 1,513 by 138 feet.

The Dock Board had begun the building of a general commodity warehouse, on the same principles carried out in the cotton and grain terminals, but that work has been taken over by the government for its purposes in the war.

The public belt railroad, the result of persistent effort on the part of the Belt Board, is a highly effective system connecting all water terminals and warehouses with all railroad trunk lines. It comprises sixty miles of tracks, with numerous sidings. The board operates thirteen locomotives on the belt.

The harbor facilities at New Orleans include drydocks, and four coal

tipples, which are used for transferring coal from cars to barges. **Ships are coaled while at the wharves, towboats conveying the coal barges, which are equipped with coaling equipment, alongside the ships. The coaling is done while ships are discharging or taking on cargoes.**

As to present river traffic at New Orleans, it is in the same state of decadence as at other cities on the waterway system. There is only a straggling packet traffic, from short distances. The tonnage is scarcely an item of consequence. The difference in the situation is that New Orleans is ready for river traffic on a modern and extensive scale.

The table of exports and imports at New Orleans indicates the immense possibilities for traffic in modern river barges. Of the immense tonnage exchange between railroads and ships, much could be between ships and river barges. Taking only the leading items, New Orleans exported last year 17,000,000 bushels of wheat, 10,000,000 bushels of oats, 14,000,000 bushels of other grain, 3,000,000 barrels of flour, 45,000,000 pounds of steel bars, 17,000,000 pounds of galvanized iron, 58,000,000 pounds of leaf tobacco, 989,000 bales of cotton, and large quantities of meats, food products and virtually all lines of manufactured products. A large cargo in those lines could move to New Orleans by river, but last year it all went there by railroad.

Among imports, New Orleans last year received 285,000,000 pounds of coffee, 213,000,000 gallons of mineral oils, 881,000,000 pounds of sugar, 44,000,000 gallons of molasses, 18,000,000 bunches of bananas, and large amounts of various minerals, chemicals and miscellaneous items. Much of that could have been moved from New Orleans to the north by river, but it was carried from the city by railroad.

New Orleans is ready for an extensive river traffic. It is the logical harbor for much of the vast output of the Mississippi Valley. The use of river barges to move much of that output to New Orleans, to ships and warehouses, would mean relief for the overtaxed east and west railroads of the country, in this time of heavy war demands.

MISSISSIPPI SYSTEM AS A TRAFFIC FACTOR

Observation and study at more than forty of the more important cities along the Mississippi River and its principal tributaries have established, as entering into the possibilities for war transportation on the nation's great inland waterway system, the following factors:

There are along the waterway system originating sources of immense freight tonnages in leading commodities destined either for export or for shipments to other points along the waterway.

Almost all of such freight now is moved by rail.

Much of the freight which is produced in the Mississippi Valley and concentrated for shipment at points along the waterway is carried by rail to Atlantic ports.

There is a total absence of through river traffic.

With a few minor exceptions, the present available river craft is of antiquated design.

Many of the cities along the waterway will be ready, within a year, with modern municipal river terminals.

New Orleans, as the gateway port between the inland waterway system and the sea, has extensive water front terminal facilities, and is equipped to expedite use of the waterway for war transportation.

Added to these factors is the prospect of government aid. Barges and towboats are being built for the Upper Mississippi, between the Twin Cities and St. Louis. Favorable recommendations have been made with respect to the request of the Mississippi Valley Waterways Association for government barges and towboats to operate on the Lower Mississippi between St. Louis and New Orleans. The War Department also has agreed to clear the channel of the Illinois and Michigan Canal, so that Chicago may be in direct contact with the Mississippi Waterway System.

Thus, the situation with respect to the three essentials of waterway traffic is this: Tonnage is available in immense measure; modern terminals, to a limited extent, will be available next year; barges and tow-

boats are a prospect at the hands of the government.

The basic essential, of course, is navigability. The navigable channel, throughout the waterway system, is not uniform. For ultimate navigation, on a proper scale, considerable channel development must be done. The necessary work on the Missouri and Ohio rivers has been only about 60 per cent completed. Under present conditions, navigation on the Upper Mississippi is difficult at low water seasons. Navigation on the Lower Mississippi is reasonably dependable. The channel of the Illinois River, likewise, is reasonably dependable. Navigation is less dependable on the Arkansas and Red rivers. It is at once apparent that proper development of the inland waterway system, for permanent commercial purposes, calls for a program of conserving the water supply, to maintain effectively navigable channels at all times.

With respect to the present situation, however, concerning the question of using the waterway as a transportation asset in prosecuting the war, it must be stated that there is not even an approach to a use of the available opportunities for navigation. To make full use of the varying channels, as they exist, involves merely the question of providing types of craft adapted to the conditions to be met. **While it is true that immediate water transportation on the Mississippi system would have to be subjected to the limitations imposed by channel conditions and inadequate channel development, it is equally true that those limitations do not justify a total disregard of the opportunity for using the great water avenue to supplement and relieve the overtaxed railroads. In other words, it is possible to carry on an immense movement of freight on the Mississippi River and its tributaries, in their** present state.

The poor showing made by some of the packet lines operated over various short portions of the waterway is not at all a criterion by which to judge the feasibility or economy of river traffic. The method of the packet line, in most instances, has

been wrong in principle. The process has been to wait for a capacity cargo, at the sacrifice of operating on schedule. The average packet line has expected to start in at once earning a profit. There has been virtually no thought of building up a regular and dependable service as the necessary forerunner of a profitable business.

There has been failure to adopt modern transportation methods in river traffic. Applying the present predominating river methods to the railroads would mean to have a locomotive stand idle every time a freight car was being loaded or unloaded. The modern idea of towboats and barges is to overcome that wasteful and expensive practice. The barge is to take the place of the freight car, to be "sidetracked" for loading or unloading. The towboat, like the locomotive, is to keep on the move.

The situation with respect to river terminals at the various cities along the waterway has been discussed in detail in the preceding articles. Summing up that essential phase of prospective water traffic, the situation may be referred to briefly as follows: Minneapolis in all probability will be ready with a completed terminal unit next year. St. Paul will have facilities for handling ore, coal and general commodities. Along the Upper Mississippi, Davenport and Muscatine will be ready with modern terminals. Alton has a modern private terminal. Clinton and Quincy are at the point of launching plans. On the Illinois River and its canal connections, Chicago can contribute the use of its extensive harbor facilities, and La Salle and Peoria are planning to equip themselves with initial terminal units. On the Missouri River, Kansas City has a municipal terminal of modern design, to which further equipment is to be added. St. Joseph is considering plans. St. Louis has two private modern terminals and the municipal terminal now under construction ought to be completed during the present year. On the Ohio River, Pittsburg, while without definite plans for municipal terminals, can contribute the use of extensive private facilities. Among other cities

along the Ohio and its tributaries, Nashville and Louisville expect to provide terminals within a year, and Evansville is discussing plans. On the Lower Mississippi, private terminals for ore and oil have been established opposite Memphis. The city of Memphis is to provide a $500,000 terminal. New Orleans, as has been stated, is ready with extensive facilities of modern type.

The opportunity for diverting tonnage to the waterway is almost without limit. The Mississippi Valley is the nation's great producer of grain, meat and other food products. It contributes in large measure to the manufactured output of the country. The cities along the waterway system are the important assembling points for grain, flour, cotton, lumber, coal and machinery. They are direct contributors to war needs both in food and munitions.

The great demand in war transportation is for relief for the east and west trunk lines and the crowded Atlantic ports. The Mississippi waterway system offers relief for both agencies. **The waterway is like a giant system of highways, spread through the valley. At the port gateway of that system, New Orleans is prepared to handle an immense tonnage transfer from river barges to ocean freighters.**

Seven of the ten leading primary grain markets of the country are on the Mississippi waterway system. They are Minneapolis, Chicago, Omaha, Kansas City, St. Louis, Peoria and Cincinnati. Taking government figures for 1916, the aggregate grain receipts of those seven cities were almost double the grain receipts at the exporting ports: New York, Boston, Philadelphia, Baltimore and New Orleans (the receipts at the ports including all through foreign shipments from inland cities). **Although those seven leading inland shipping points for grain were all on a water avenue leading directly to New Orleans, only 9 per cent of the grain received at the five leading seaports went to New Orleans and even that 9 per cent went to the gateway of the Mississippi waterway system by railroad.**

The aggregate grain receipts at the seven cities named (to say noth-

ing of the numerous other grain centers on the waterway system) were almost three times the total grain export of the United States last year.

The same seven cities last year manufactured 24,600,000 barrels of flour. The total flour export of the United States last year was only 14,000,000 barrels. Yet, New Orleans, as the gateway for the waterway system, providing natural transportation avenues from those seven cities, received only 3,328,000 barrels of flour, and that flour was sent to New Orleans by railroad. The receipts of flour at the cities named, added to their manufactured output, last year raised their total supply of flour to 40,000,000 barrels.

These citations can leave no doubt of the opportunity for use of the waterway system for grain and flour, as a means of releasing the railroads from their heavy burden. To them should be added the items of iron ore from the north, cotton from the south, pig iron from the Birmingham district, heavy manufactured products from the Pittsburg and Wheeling districts, coal from the Illinois, Pennsylvania, West Virginia and Kentucky fields, packing house products from Chicago, Kansas City and St. Louis. There should be added the heavy transfer of manufactured commodities from the larger cities to the jobbing centers, and the heavy movement of agricultural machinery to the centers of the districts which have their vast stores of grain to offer river traffic. Then can there be no doubt that tonnage, in unlimited supply, awaits only barges and towboats and proper terminals to be diverted to the great natural, unused, ignored avenues of waterway commerce.

Assuming that the expected government aid will be forthcoming in time for river traffic next year, there will be barge traffic throughout the length of the Mississippi River—one line between Minneapolis and St. Louis, and another between St. Louis and New Orleans. There is already a limited barge traffic on the Missouri River, between Kansas City and St. Louis. Barges quickly should be provided for use on the

Illinois River and the canal to Chicago. Barges should be provided for through traffic on the Ohio River. The Red and Arkansas Rivers should be used for transporting cotton and lumber. Transportation on the Missouri River should be extended above Kansas City, to Omaha and Sioux City.

With terminals and boats, even in the limited measure promised for next year, freight traffic on the Mississippi River and its tributaries ought to be a real war transportation factor in 1919. Its possibilities are tremendous.

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